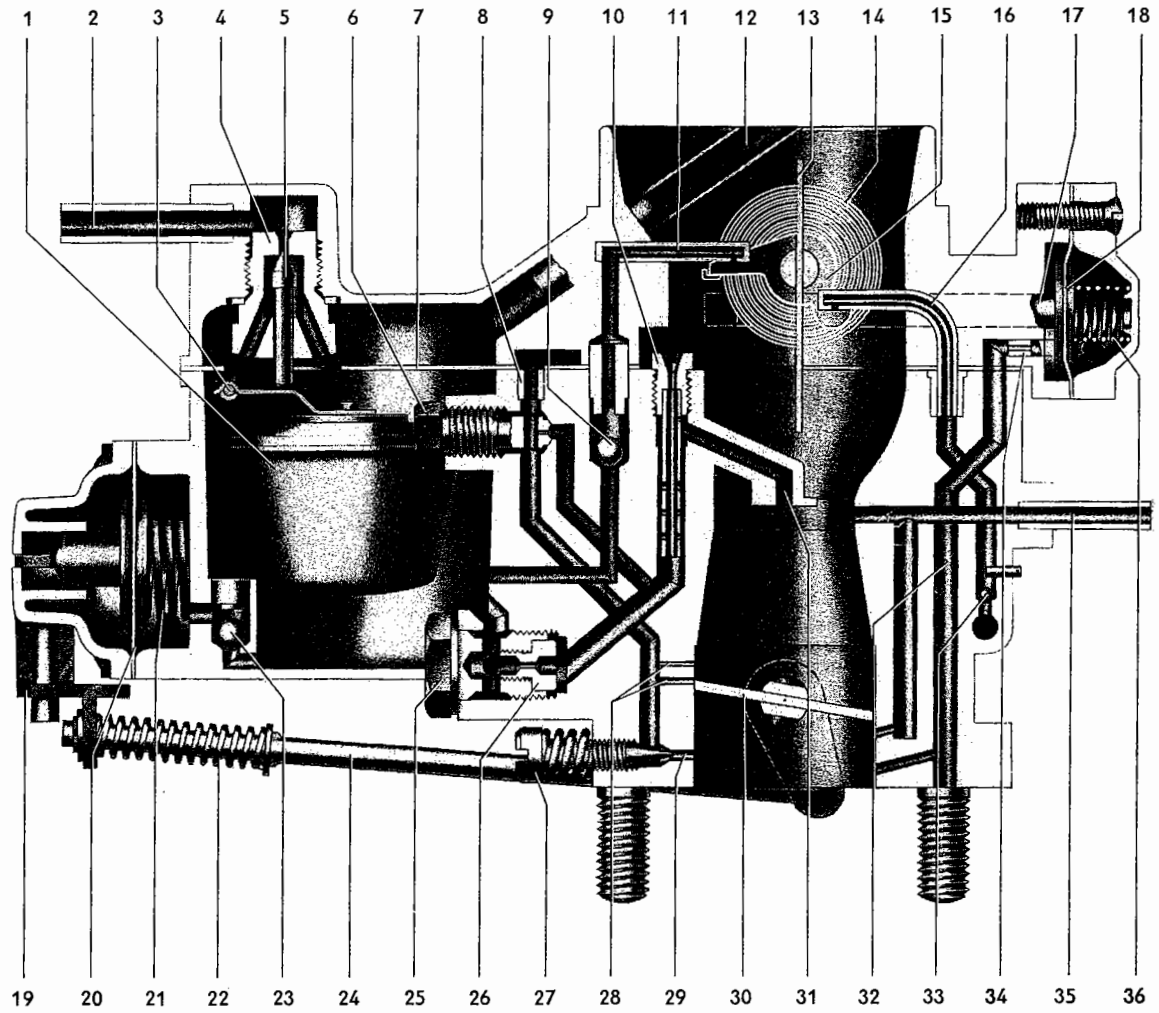


SOLEX 28 PICT-1

1 - Float
2 - Fuel line
3 - Float lever
4 - Float needle valve
5 - Float needle
6 - Pilot jet
7 - Gasket
8 - Pilot air drilling
9 - Ball check valve in power fuel system
10 - Air correction jet with emulsion tube
11 - Power fuel tube
12 - Float bowl vent tube
13 - Choke valve
14 - Bi-metal spring
15 - Operating lever
16 - Accelerator pump discharge tube
17 - Diaphragm rod
18 - Vacuum diaphragm
19 - Pump lever
20 - Pump diaphragm
21 - Pump spring
22 - Spring
23 - Ball check valve for accelerator pump
24 - Pull rod for vacuum diaphragm
25 - Main jet carrier
26 - Main jet
27 - Volume control screw
28 - By-pass port
29 - Idle port
30 - Throttle valve
31 - Discharge arm
32 - Vacuum drilling
33 - Ball check valve in accelerator pump drilling
34 - Jet in vacuum drilling
35 - Vacuum connection
36 - Spring for vacuum diaphragm

General

The carburetor consists of two main parts: the upper part and the lower part. A gasket is fitted between the two parts and they are held together by five slotted screws.

The connection pipe for the fuel line and the float needle valve are installed in the upper part of the carburetor. The vent tube for the float chamber and the delivery pipe for the additional fuel are pressed into the upper part which also accomodates the automatic choke. This consists of the choke valve shaft with the choke valve, a fast idle cam and a lever, on one side of the barrel. On the other side is a heater element and bi-metal thermostatic spring embedded in a ceramic plate which is secured by a retaining rind and three screws in a housing cast onto the carburetor. A further cylinder cast on this housing contains a sliding vacuum piston. This cylinder is connected by a passage to the vacuum below the throttle valve.

The lower part of the carburetor contains the mixing and float chambers, the float and all the parts required for the preparation of the fuel-air mixture. The carburetor is secured to the induction manifold by two studs in the lower flange. The throttle valve and shaft are located below the mixing chamber and operated by the throttle lever. The accelerator pump, housed in a casting on the side of the float chamber, is connected to the throttle valve shaft by means of a lever and a connecting rod. The fuel is maintained at a constant level in the carburetor by the float and float needle valve.

The automatic choke arrangement in the upper part of the carburetor facilitates engine starting and controls the mixture preparation for idling and driving until the engine has attained its normal operating temperature.

The fuel-air mixture for the engine is produced in the carburetor. The fuel is atomised and thoroughly mixed with air in the proper proportions for efficient combustion. The principle of the downdraft carburetor makes full use of gravity to improve the cylinder charge and this increases engine flexibility and performance and facilitates the starting procedure.

The carburetor has a central air intake fitted with an oil bath air cleaner which ensures that the air for the mixture and the float chamber ventilation is cleaned under all operating conditions. This arrangement reduces the ingress of dirt into the carburetor to a minimum and prevents the fuel consumption from being influenced by the accumulation of dirt in the air cleaner.

The air drawn in by the engine enters the air cleaner via a tube mounted at the side and fitted with a flap valve with a balance weight. This valve opens and closes automatically according to engine speed and controls the entry of cold and pre-heated air. At idling speed the proportion of warm air is at its largest and this helps to eliminate carburetor icing. At temperatures over 20° C (68° F) the valve should be fixed in the open position with the clip.

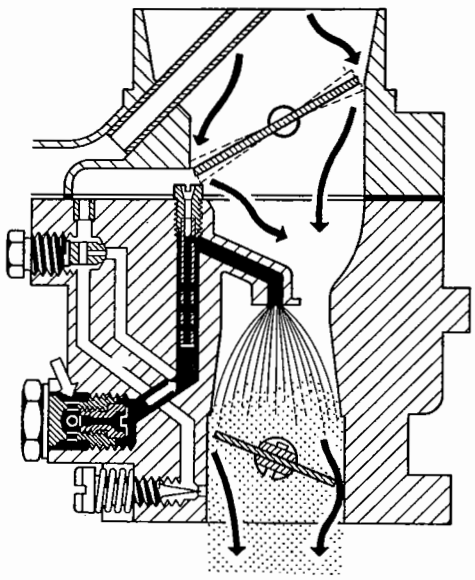
The function of the idling circuit can be considered as that of an auxiliary carburetor which takes over the preparation of the mixture when the throttle valve is almost closed. The idling mixture can be enriched or weakened by means of the volume control screw. The engine idling speed is controlled by the idle adjusting screw. The newly designed idling stop segment on the fast idle cam ensures that the idling speed corresponds correctly with the choke valve position from the moment the engine is started until the normal operating temperature is attained.

The pre-heating of the intake not only prevents the condensation of the fuel vapor but also assists the creation of a readily combustible mixture.

The automatic choke improves engine starting under all weather conditions. The choke valve shaft is tensioned by a spiral shaped bi-metal spring which responds to every change of temperature. When the engine is cold the choke, actuated by the movement of the bi-metal spring as it cools off, is more or less closed according to the outside temperature. When the bi-metal spring is heated it loses its closing effort and the choke valve can open progressively until the normal operating temperature is attained and the air intake is completely clear. The bi-metal spring is heated by the heater element embedded in the ceramic cover on the spring housing The opening of the choke valve is assisted by the off center mounting of the choke valve shaft in the air intake passage. The air stream being drawn in thus tends to open the valve and this effort is further influenced by the fact that the freely pivoted fast idle cam on the choke valve shaft is designed as a balance weight and also works in the opening direction. When the choke valve is closed the throttle valve is simultaneously opened slightly. This is achieved by the fixed lever on the choke valve shaft lifting the fast idle cam when the choke closes and bringing the stop segment, on which the idle adjusting screw on the throttle lever rests, into operation.

When the choke is fully closed the idle adjusting screw is pushed into the outer position thereby opening the throttle valve slightly and allowing the vacuum created when starting the engine to take full effect below the choke valve.

This vacuum lifts the fuel from the emulsion tube into the mixing chamber via the discharge arm. The air required for the mixture is drawn in past the choke valve which then commences to flutter between the open position — under the influence of the vacuum — and the closed position — under the influence of the bi-metal spring tension. In this manner a very rich mixture is created which ensures easy engine starting even at very low temperatures. As the engine warms up the choke begins to open and the proportion of air in the mixture increases and automatically weakens it. This weakening continues until the choke valve reaches the vertical operating position.

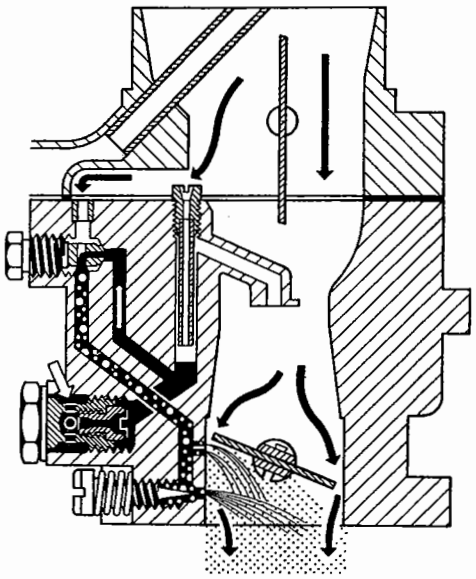


The vacuum piston belonging to the automatic choke is connected to the choke valve shaft by a piston rod and lever. The sealed artight chamber above the piston is connected to the space below the throttle valve by a passage so that the vacuum existing there is also effective at the piston. The function of the vacuum piston is to open the choke valve slightly against the pressure of the bi-metal spring when the engine speed increases after starting, under light loads or when the vehicle is over-running the engine and thus provide an air bleed to prevent the mixture from becoming excessively rich. This is brought about by the piston being moved by the vacuum below the throttle valve increasing as the engine speed rises.

On starting a cold engine, the fuel flows from the fuel line through the float needle valve into the float chamber and on via the main jet, emulsion tube and spraying arm into the mixing chamber where it mixes with the air being drawn past the fluttering choke valve. This very rich mixture then passes to the engine through the slightly opened throttle valve.

At **idling speed**, that is, when the throttle valve is almost closed the micture takes place in an entirely different manner. With the throttle valve in this position the air speed, and consequently the vacuum in the venturi, is so low that the fuel will not be drawn out of the spraying arm. The carburetor is therefore equipped with an idling circuit which provides an approximately correct mixture by means of a pilot jet and a fixed pilot air bleed. This mixture is fed to three small ports below and level with the throttle valve. The idling mixture can be enriched or weakened by means of the volume control screw. Two of the three ports are known as

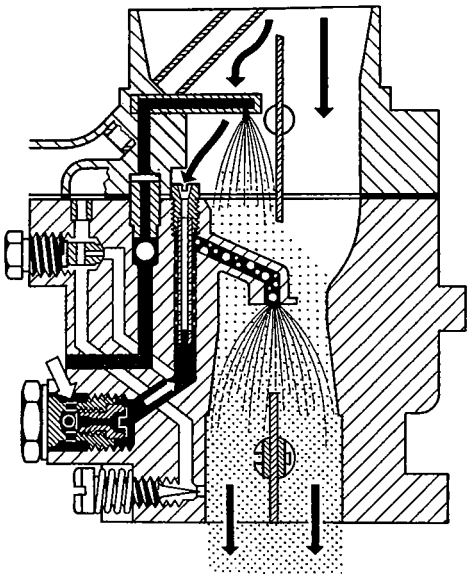
by-pass ports. The idling mixture is also drawn from the port which is exactly in line with the edge of the throttle valve. The other port, which is slightly above the edge of the closed throttle valve only comes into operation when the throttle is opened slightly. Both ports help to improve the transfer from the idling circuit to the main jet system as the mixture is drawn out of the drillings by the increased speed of the air passing the partly opened throttle valve. When the throttle is closed quickly the idling mixture is automatically weakened if the idling has been adjusted properly by means of the idle adjusting screw on the throttle lever.



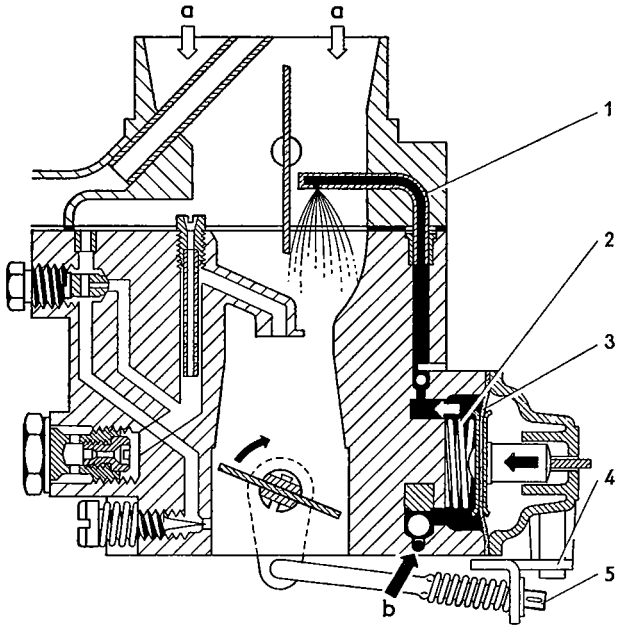
The fuel flows from the fuel line through the float needle valve to the float chamber and then via the main jet to the pilot jet. With the choke valve fully open the air is fed through the fixed pilot air bleed and the mixture passes to the idling and by-pass ports. The air passing the partly opened throttle valve draws the mixture with it. The adjustment of the volume control screw governs the proportions of fuel and air in the mixture.

During normal operation the vacuum in the intake passage draws the fuel out of the spraying arm which is connected to a vertical well containing the air correction jet with the emulsion tube pressed into it. Fuel flows to this well from the float chamber via the main jet. The factors governing the amount of vacuum are the size of the cost-in venturi, the engine speed and the throttle opening. The specially designed restriction of the venturi — where the spraying arm ends — has an accelerating effect on the air being drawn in by the engine. This gives — in connection with the position of the throttle valve — a varying degree of vacuum and draws different quantities of fuel from the spraying arm. As the fuel level in the emulsion tube drops due to the rising vacuum created by the increasing throttle opening, air is simultaneously drawn in through the air correction jet. This air passes out of the holes in the emulsion tube as they are uncovered and mixes with the fuel flowing from the main jet, thus progressively weakening the mixture as the engine speed increases.

In the part-load and particularly in the full-load ranges the fuel flows from the fuel line through the float needle valve to the float chamber and on via the main jet and emulsion tube well to the spraying arm. Here it mixes with the induction air in the mixing chamber — at part-load — with the choke fully open and the throttle partly open. At full-load, additional air enters via the air correction jet and mixes with the fuel in the emulsion tube well. The choke and throttle are both fully open.



The function of the additional **Power Fuel System** is to provide the richer fuel mixture required at full load conditions and high engine speeds to enable the engine to give maximum performance. A calibrated power fuel tube connected to the float chamber by a passage in the carburetor body is installed in the upper part of the carburetor. The tube ends roughly at the level of the choke valve shaft, in an area where the vacuum is reduced. At low and medium revolutions the vacuum is not high enough to draw fuel out of the power fuel tube as y ball has to be lifted before fuel can flow through the passage. Only when the engine is at full load speeds and the vacuum is high enough to lift the fuel up to the power fuel tube does the additional fuel feed from the power fuel system commence. The feed is progressive and increases in quantity until the maximum engine speed is reached. This ensures that the engine gives full power with the lowest possible part-load consumption and low specific consumption in the lower full-load range.



The **accelerator pump** is operated from the throttle shaft by a connector rod and pump lever. When the trottle valve is closed the diaphragm spring presses the pump diaphragm to the rest position and the chamber in front of the diaphragm fills with fuel drawn in from the float chamber via a ball valve. When the throttle valve is opened, the movement is transmitted to the diaphragm through the linkage. The pressure stroke of the pump opens a ball check valve in the delivery passage and fuel is forced through a calibrated discharge tube into the mixing chamber. This additional fuel enriches the mixture and ensures a smooth transfer and rapid acceleration. The amount of fuel delivered is governed by the stroke of the pump. The calibrated discharge tube only controls the amount of fuel delivered in a given time and therefore the duration of the injection.

a - Air
b - Fuel from float bowl

1 - Discharge B tube
2 - Diaphragm spring
3 - Pump diaphragm
4 - Pump lever
5 - Pump connector rod

The accelerator pump enriches the mixture in the low and medium speed range only, as the spring on the connecting rod holds the diaphragm in the depressed position as the throttle is opened further and prevents the pump from refilling with fuel until the throttle is almost closed again.

Adjustment

The carburetor settings have been tested and established at the Volkswagen Factory and should not normally be altered. Excessive fuel consumption and poor engine performance are generally due to other causes. If the idling mixture is too rich the engine will tend to stall when braking sharply. The prescribed jet combination and a correctly adjusted idling speed are essential requirements for proper carburetor functioning. The idling speed should, therefore, be carefully adjusted when the engine is warm. Furthermore, the valve in the intake tube on the air cleaner should only be fixed in the open position when the outside temperature is over 20° C.

Removing and Installing Carburetor

Removal

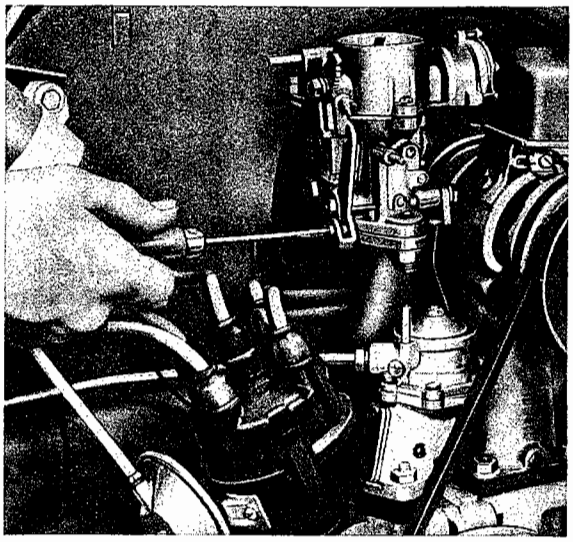
1 - Detach pre-heater connection on the intake tube of the oil bath air cleaner.

2 - Remove oil bath air cleaner.

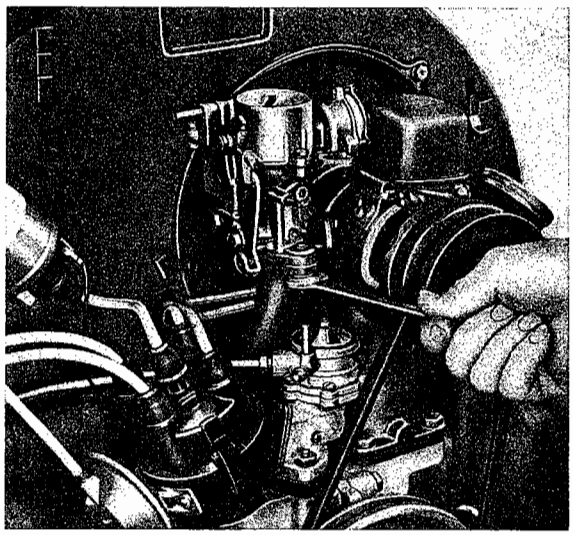
3 - Disconnect the fuel and vacuum lines from carburetor.

4 - Detach push-on connector for heater element.

5 - Disconnect accelerator cable at throttle lever and remove spring, washer and cable swivel pin.



6 - Unscrew carburetor securing nuts with a 13 mm starter spanner and remove carburetor.



Installation

The following points must be observed during installation:

1 - Install new gasket at intake manifold flange.

2 - Secure accelerator cable on the throttle lever as follows: Open throttle so that there is a clearance of about 1 mm (.04") between throttle lever and the stop on the carburetor body. Place the accelerator pedal in the fully depressed position and connect the cable to the throttle lever. All other operating linkage should be installed free of play and stress.

3 - Do not overtighten the intake elbow securing screw.

4 - Do not forget the heater element connection.

5 - Adjust idle speed with engine warm.

Disassembly and Assembly of Carburetor

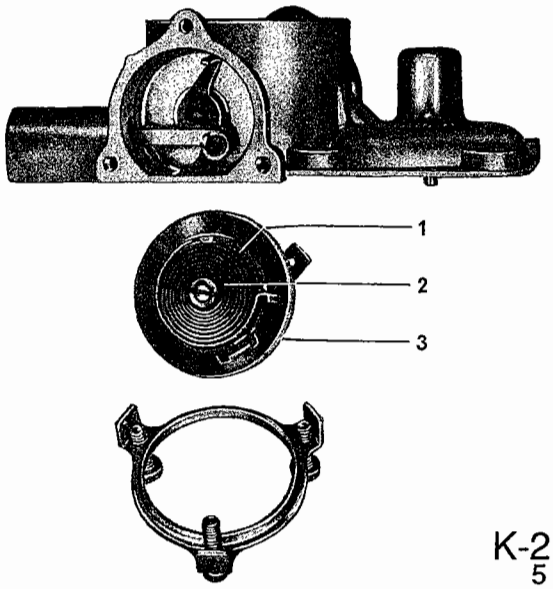
Disassembly

1 - Remove carburetor.

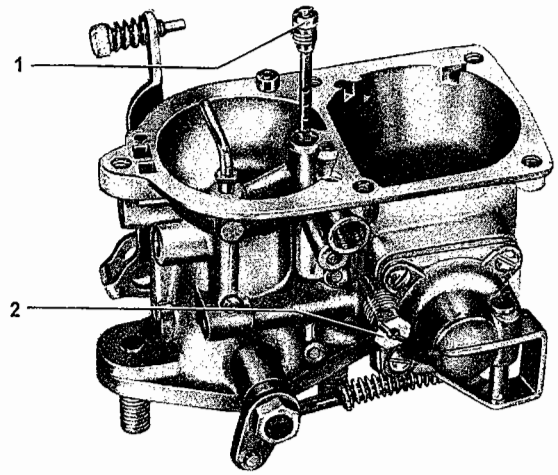
2 - Remove the five screws securing the upper part and lift it off.

3 - Screw out float needle valve.

4 - Remove the three screws in the automatic choke and take off retaining ring together with the ceramic plate, bi-metal spring and heater element.



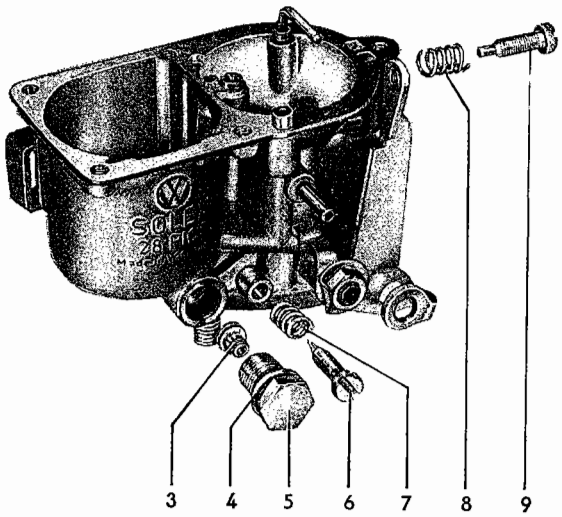
1 - Heater element 2 - Bi-metal spring 3 - Ceramic plate



5 - Take out the float.

6 - Screw out the air correction jet with the emulsion tube and the idling jet.

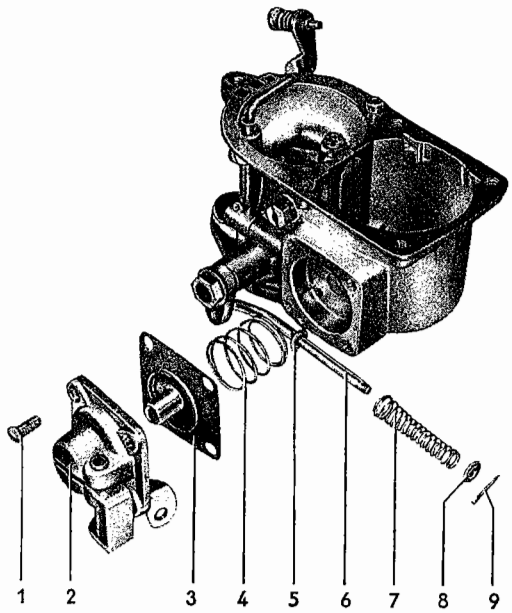
1 - Air correction jet with emulsion tube
2 - Pilot jet



7 - Screw out the main jet carrier with main jet and the volume control screw.

3 - Main jet
4 - Gasket
5 - Main jet carrier
6 - Volume control screw
7 - Spring
8 - Spring
9 - Idle adjusting screw

8 - Remove pump lever cotter pin from the connector rod.



9 - Remove four pump cover retaining screws and take off cover, diaphragm and spring.

1 - Screw
2 - Pump cover
3 - Pump diaphragm
4 - Diaphragm spring
5 - Washer
6 - Pump connector rod
7 - Spring for connector rod
8 - Washer
9 - Cotter pin

Cleaning

Under no circumstances should pins or pieces of wire be used to clean the jets as they will damage and enlarge the calibrated drillings.

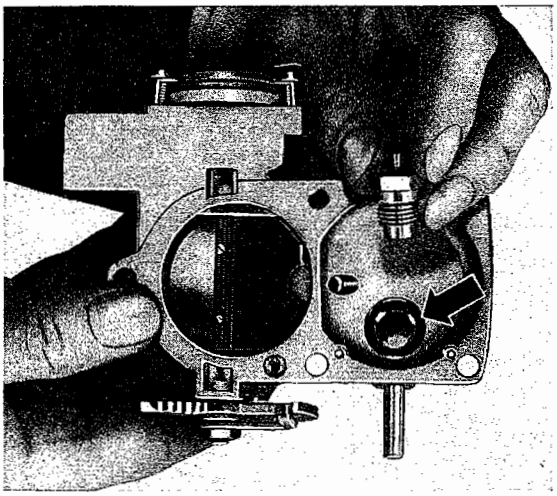
Checking and Assembly

The assembly is a reversal of the disassembly procedure. When checking the parts observe the following points:

Upper part

1 - Check needle valve for leaks.

2 - Examine needle valve gasket condition and check correct seat when installed.



3 - Check carburetor body gasket.

4 - Check play in choke valve shaft.

5 - Check heater element and bi-metal spring. If one of the parts is damaged the complete ceramic plate must be replaced.

Important

When installing the ceramic plate with bimetal spring and heater element, take care that the marking on the ceramic plate corresponds with that on the spring housing.

Note:

It may occasionally be found that the automatic chohe becomes very dirty and the vacuum piston seizes in the cylinder due to the formation of deposits from the crankcase ventilation system. The choke valve can then no longer open fully so that difficulty is experienced when starting from cold and the fuel consumption rises considerably.

When this occurs, proceed as follows:

Check the automatic choke

1 - Take ceramic cover off carburetor. The heater element and bi-metal spring must not be encrusted with burnt oil.

2 - Try to turn the choke valve shaft with the operating lever. If there is no sign of movement, the choke valve shaft is seized. If there is a small amount of movement due to the play in the linkage connecting the vacuum piston, the choke shaft is free but the vacuum piston is seized.

Remedy

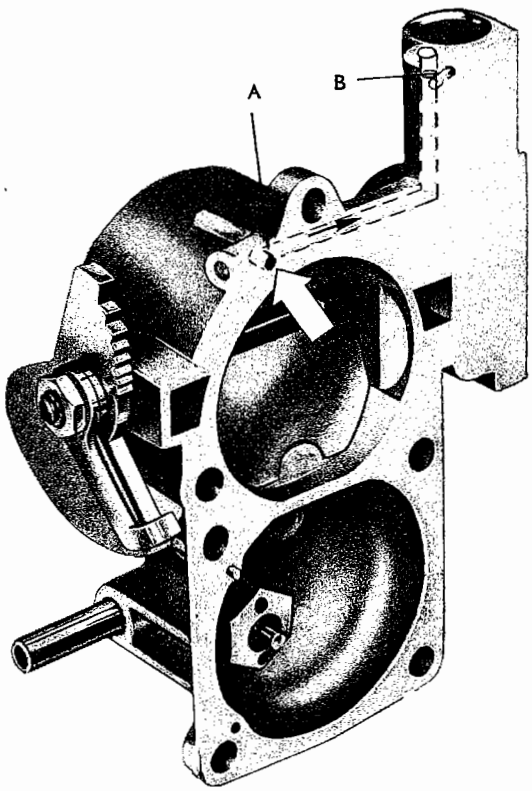
1 - Remove top of carburetor.

2 - Drill the cylinder end cover with a 4—5 mm drill and pull cover out.

3 - Clean automatic choke housing with acetone.

4 - Squirt acetone into cylinder from both sides and move piston to and fro. Clean cylinder thoroughly.

5 - Blow out the vacuum drilling (A) to the cylinder with compressed air and clear the opening (B) in the cylinder with a piece of thin wire.

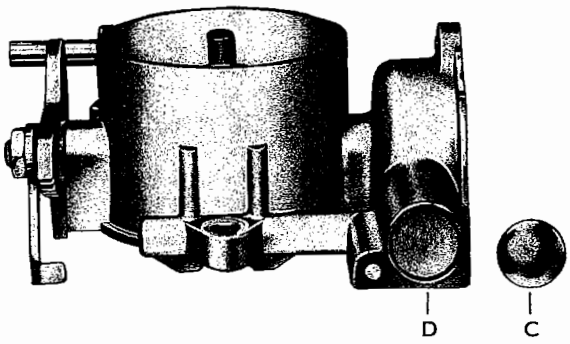


A = Vacuum drilling
B = Opening in cylinder

6 - Place new end cover (C) — Part No. 113 129 119 — in the cylinder with the convex side outwards and tap lightly with a hammer and 11—12 mm diameter punch so that the cover spreads (D). Seal edges with sealing compound.

7 - Install a new ceramic cover (Part No. 113 129 191) if the heater element is encrusted with deposits.

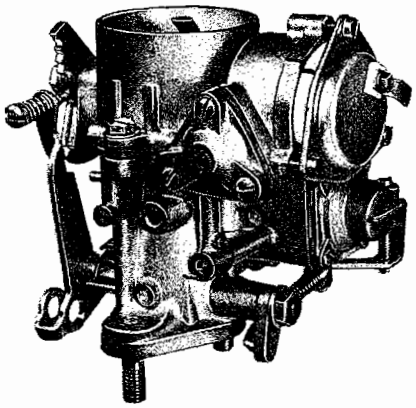
8 - Install carburetor top.



C = New end cover
D = Cover installed and sealed

Note:

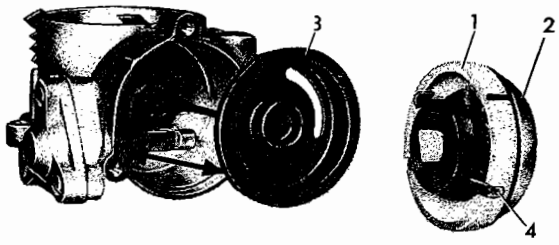
From November 1963, Chassis No. 5 909 656 (Engine No. 8 154 031) the carburetor was fitted with a new top part with a modified automatic choke. The designation is now **28 PICT-1.**



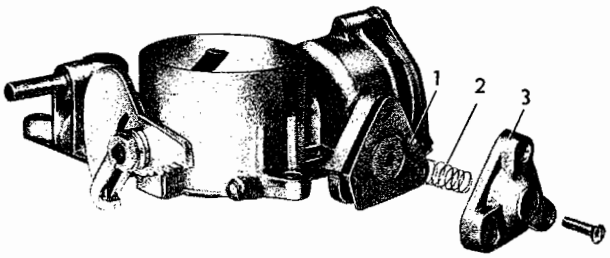
The new automatic choke incorporates the following modifications:

1 - The housing for the automatic choke is larger and the ceramic cover (1) is insulated externally by a metal cap (2). The lateral support and heat insulation of the bimetal spring has been improved by a plastic insert (3) in the housing. A ceramic rod (4) prevents the heater element from coming into contact with the bimetal spring. The plastic insert has a small projection on the outer edge which engages in a slot in the automatic choke housing.

The retaining ring for the cover is supported against the automatic choke housing by small spacer bushes (Part No. 113 129 198).

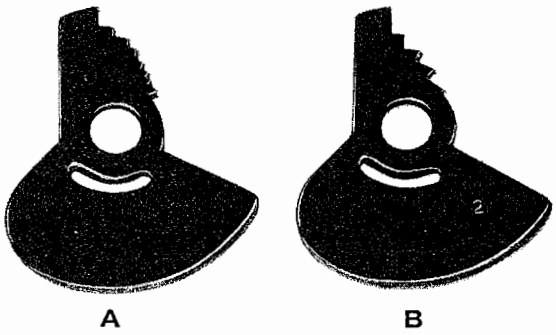


2 - The vacuum piston used formerly has been replaced by a diaphragm which opens the choke valve as the vacuum increases.



1 - Vacuum diaphragm
2 - Diaphragm spring
3 - Cover for diaphragm

3 - The previous fast idle cam had 9 steps (A), the new one has 6 (B). This means that the idling speed now alters in slightly larger stages.



4 - The same jets are used in the carburetor.

5 - The bottom of the oil bath air cleaner (Part No. 113 129 613 B as before) has a small depression to suit larger dimensions of the automatic choke housing.

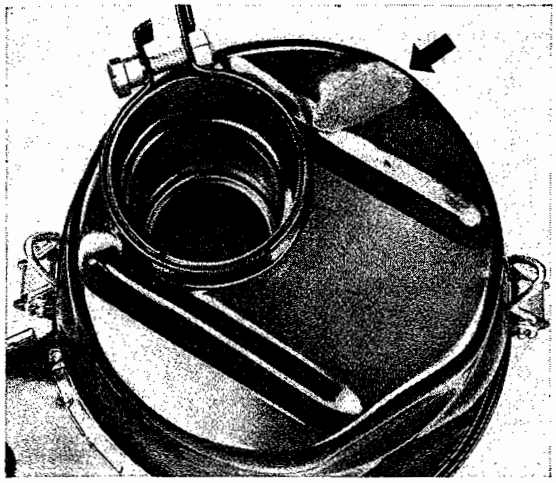
6 - The two generator mounting holes in the fan housing cover (new Part No. 113 119 261 A) have been turned to 10° 30′ to the right (formerly 5° 30′). The generator is thus inclined more so that the space between the choke housing and the voltage regulator is larger.

The modified carburetor or the modified carburetor upper part can be service installed in all 34 bhp engines.

On installation, ensure that there is sufficient space between the automatic choke housing and the regulator on the generator as otherwise there is a risk of a short circuit at the heater element terminal.

If the space is not sufficient, the generator should be removed and the fan housing cover plate exchanged. When the new cover (Part No. 113 119 261 A) is used, the generator is turned to 10° 30′ to the right.

On the Type 1 models 11 and 15, the bottom of the air cleaner must be depressed 2—3 mm with a hammer in line with the upper screw of the choke retaining ring so that the flange of the air cleaner goes on to the carburetor upper part far enough.

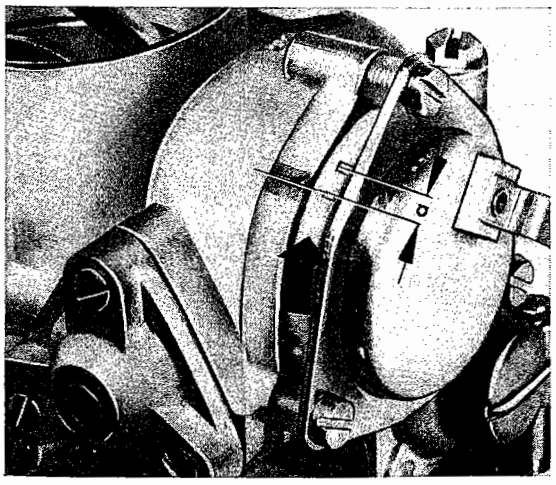


Should it be found necessary to depress the bottom of the air cleaner more than this, it is better to fit a new air cleaner because if depressed too much the cleaner may not seal properly on the carburetor or the sheet metal may be torn.

Note:

In some 28 PICT-1 carburetors the bi-metal spring in the automatic choke is tensioned too much even though the marks are aligned properly. This makes the choke open late and gives a very rich mixture. When starting from cold this, in turn, causes excessive smoke at the exhaust and uneven engine running.

This trouble can be eliminated by turning the ceramic cover of the automatic choke about 4—5 mm to the right (a). This opens the choke earlier and weakens the fuel-air mixture.

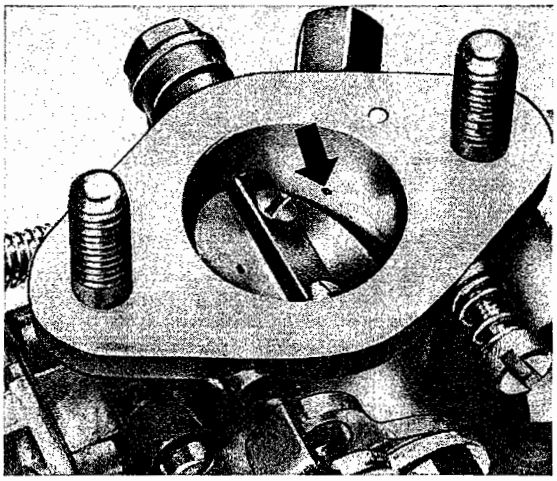


a = 4—5 mm (.16—.2″)

Note:

Spitting in the carburetor, poor and sluggish transfer in the part-load range and low output has been reported recently on some of the 30 bhp engines fitted in the Volkswagen 1200 A with fully synchronized transmission (from November 1964). This trouble is caused by insufficient spark advance in the part-load range and can be remedied as follows:

1 - Remove the carburetor and open out the drilling behind the threaded connection for the vacuum pipe with a 1.7 mm twist drill. The drill should be passed through the connection. Blow out metal chippings carefully with compressed air.



2 - Set ignition timing to 10° before TDC (right-hand mark on crankshaft pulley) with the engine cold.

Lower part

1 - Check pump diaphragm for leaks and replace if necessary.

Note:

Spitting in the carburetor on sudden acceleration generally indicates a leaky pump diaphragm.

2 - Dip the float in hot water. If bubbles appear the float is leaking and must be replaced. (See "Adjustment Data" for correct float weight).

3 - Check all jets for correct sizes as shown in the "Adjustment Data".

When replacing jets or valves only genuine "SOLEX" parts should be used. Only these parts are accurately calibrated and ensure correct adjustment and low fuel consumption.

Use only main jets and carriers with ring grooves.

4 - Check throttle shaft clearance. Excessive clearance encourages the ingress of secondary air and has a detrimental effect on the starting and idling conditions. If necessary, the holes for the throttle shaft must be bushed.

5 - Examine the tapered portion of the volume control screw and replace if the tip is bent or broken. Only brass volume control screws should be used. Check the tapped hole and seat for the screw in the carburetor lower part and remove the tip of the old screw if it has broken off.

6 - Insert the float.

7 - Oil the steps on the fast idle cam.

Note:

On engines with the new 28 PICT carburetor it may sometimes be found that, due to corrosion caused by prolonged delivery or storage times, the fast idle cam sticks and the choke valve does not open fully.

This condition can be remedied by applying a few drops of anti-corrosion oil to the bearings and moving the cam back and forth several times.

Note:

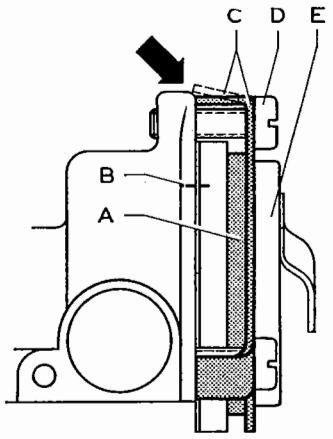
From August 1960, the carburetor lower bodies supplied as spares without the ball in the power fuel system (Part No. 141 129 301 — Karmann Ghia models and Transporter) can be distinguished from the lower bodies with ball (Part No. 113 129 301 A — De Luxe Sedan and VW Convertible) by means of the **yellow spot** on the float housing near the word "SOLEX".

Note:

From Chassis No. 3 510 198 the retaining ring for the ceramic cover was modified and now has stronger lugs.

The lugs on the previous ring tended to bend in some cases and allow the three securing screws to become loose. The ceramic cover could then turn so that the bi-metal spring no longer closed the choke valve properly and starting difficulties ensued. The setting mark on the ceramic cover must always be exactly in line with the mark on the carburetor body (B).

The modified ring (Part No. 113 129 199) as before can be installed without difficulty.



A - Retaining ring
B - Setting mark
C - Lugs on ring
D - Securing screws
E - Ceramic cover

Note:

Deposits from the crankcase ventilation system which build up in side the 28 PICT carburetor can often cause carburation troubles.

The formation of deposits not only make the vacuum piston and choke valve shaft stiff in operation, they also tend to block the pilot air bleed drilling and reduce the diameter of the air correction jet. This results in poor idling and increased fuel consumption.

Remedy

Remove carburetor and take top part off body. Soak both parts in "Speedclene" cleaning solution for several hours and then rinse thoroughly with trichlorethylene. This method is guaranteed to remove all traces of the deposits.

The carburetor can also be cleaned with trichlorethylene or acetone alone.

Manufacturer of Speedclene:
Bendix Products Division
South Bend 20
Indiana/USA

Distributor in Germany:
Messrs. A. Pierburg
Auto- und Luftfahrt-Gerätebau KG
404 Neuss/Rhein
Postfach 867

Note:

From Chassis No. 3 192 507, a different carburetor and ignition distributor are installed in vehicles with the 34 bhp engine (41.5 SAE bhp) which are equipped with a cyclone air filter.

De Luxe Sedan (M 153)

The carburetor (Part No. 113 129 023 F) for engines with the cyclone air filter differs from the standard carburetor (Part No. 113 129 023 D) in that the upper vacuum drilling to the venturi and the power fuel jet are blocked.

The Bosch VJU 5 BR 8 distributor (Part No. 111 905 205 F) is used for this version. The ignition timing point is 12,5° before T.D.C. The right hand mark on the crankshaft pulley should be 4 mm (.16") to the left of the crankcase joint.

Karmann Ghia (M 154)

The carburetor (Part No. 141 129 023 E) which is used on the Karmann Ghia models has a 130 main jet, a 170 Z air correction jet and the vacuum drilling to the venturi is blocked.

The distributor and the ignition timing are the same as on the de Luxe Sedan.

The SP Set No. 80 A is available for service installation in the De Luxe Sedan and Set 81 A for the Karmann Ghia models. The installation is described in the supplement to Technical Bulletin K 7.

Note:

From January 1963, 34 bhp (41.5 SAE bhp) engines with the fresh air heating which was introduced in December 1962 can be fitted with a cyclone air filter as an optional extra. The order numbers are:

M 153 ..... Type 1, Model 11
M 154 ..... Type 1, Model 14

De Luxe (M 153)

Engines with cyclone filters are fitted with the 113 129 023 F carburetor and the Bosch distributor VJU 4 BR 8 (Part No. 111 905 205 F). The spark advance on this distributor is controlled by vacuum and centrifugal force. The upper vacuum drilling in the body of the above-mentioned carburetor is closed. The ignition timing is set to 12.5° before TDC. The right-hand mark on the crankshaft pulley should be 4 mm to the left of the crankcase joint.

Karmann Ghia models (M 154) and VOLKSWAGEN Transporter (M 155)

Model 14 and Type 2 vehicles are fitted with the 141 129 023 E carburetor.

The instructions on the distributor and the ignition timing are as for the De Luxe Sedan.

Servicing instructions

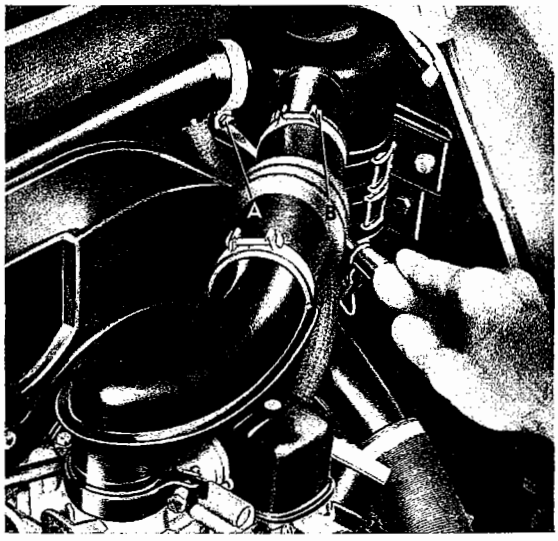
Note the following points on oil bath air cleaner servicing:

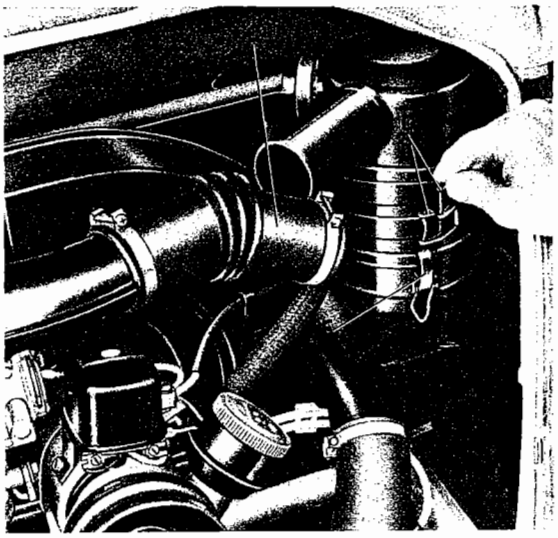
Type 1, Model 11

The air cleaner should be removed for cleaning and oil changing purposes. Proceed as follows:

1 - Loosen screw (A) on the cyclone filter connecting pipe clip.

2 - Loosen screw (B) on the clip for the hose between carburetor and oil bath air cleaner and pull hose (C) off.





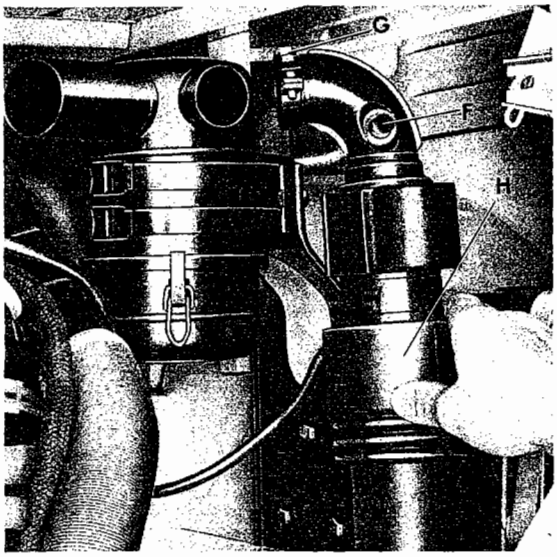
3 - Loosen two retaining straps (D) at quick release clips and press apart.

4 - Lift oil bath air cleaner out of engine compartment.

5 - Release clips on lower part of cleaner (E). Clean lower part and fill to level mark with fresh engine oil.

Important

When installing the air cleaner, ensure that all connection screws are tightened properly in order to prevent leakage.

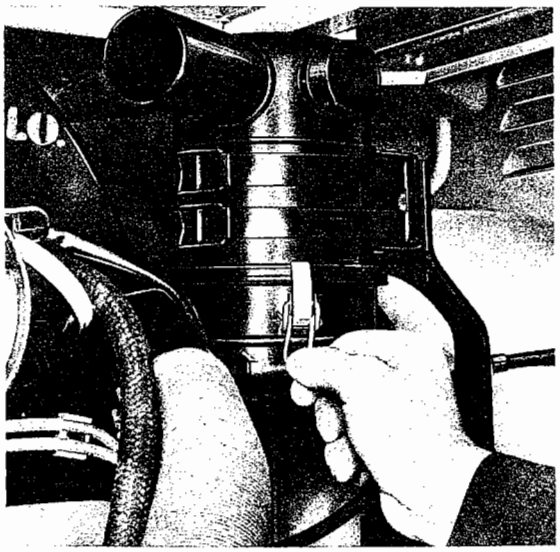


Model 14 and Type 2

1 - Pull crankcase ventilating hose off cyclone filter elbow (F).

2 - Remove cyclone filter by loosening screw (G) in elbow securing clip and pulling the rubber hose (H) out of the lower engine compartment panel.

3 - Release two clips on lower part of air cleaner. Take lower part out of engine compartment complete with insert.



Important

When the lower part has been cleaned, it should be filled to the mark with fresh engine oil. After installing the air cleaner, ensure that the screw in the cyclone filter clip is tightened fully. The groove at the lower edge of the rubber hose should be pressed into the opening in the engine compartment panel all round. If this is not done, the dust extracted by the cyclone filter will fall back into the engine compartment.

A supplement to Technical Bulletin K 7 describing the service installation of the cyclone filter in 41.5 SAE bhp engines with fresh air heating, has been issued.

Carburetor Adjustment

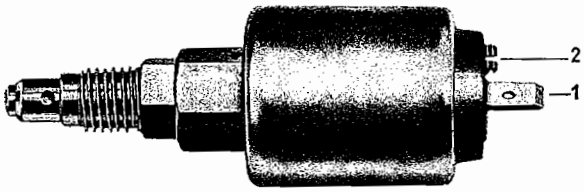
Every carburetor is tested at the factory and adjusted on the engine to suit branded fuels. Any alteration in the settings such as replacing the jets by other than the prescribed sizes is detrimental under normal operating conditions and chould be avoided. When changing from ordinary fuel to a benzine-benzole mixture it is generally only necessary to adjust the idling speed.

Specifications

Venturi (cast-in)	22.5 mm dia.
Main jet	122.5
Air correction jet (with emulsion tube)	130 y (145 y for Ghia models)
Pilot jet	55
Pilot air bleed	2.0 mm dia.
Pump jet	50
Power fuel jet	1.0
Float needle valve	1.5 mm
Float weight	5.7 g
Pump delivery quantity	0.8—1.0 cm^3/stroke

Note:

From July 1963, the solenoid switch was modified on all electro-magnetic pilot jets. There is now only the tab (1) for the cable and a grubscrew (2) on the head of the solenoid switch.



When necessary, the grubscrew can be turned to withdraw the needle valve from the pilot jet.

Turning the screw as far as it will go

to the right — closes the needle valve
to the left — opens the neddle valve

The part numbers of the electro-magnetic pilot jets available for the various engines are given in the following list.

Type	Engine	Carburetor	Pilot jet	Part No.	Voltage
1 and 2	36 SAE bhp	28 PCT	g 50 g 50	113 129 413 A 113 129 413 B	6 V 12 V
	41.5 SAE bhp	28 PICT	g 55 g 55	113 129 413 113 129 413 C	6 V 12 V

Note:

It has been noticed occasionally that the 34 and 42 bhp (41.5 and 51 SAE bhp) engines tend to idle unevenly despite the fact that the carburetor and ignition settings are correct. This trouble is caused by the distributor spark advance coming in too soon.

For this reason the vacuum drilling near the throttle valve has been moved up 0.5 mm on all 28 PICT carburetors (from Carburetor No. 4 096 708 and 8 009 601).

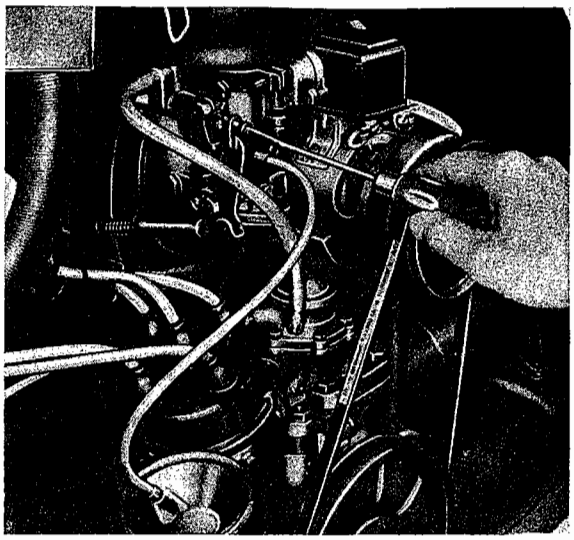
This does not apply to carburetors from No. 8 019 651 to 8 021 498. On these carburetors the vacuum drilling has not been moved.

Idling adjustment

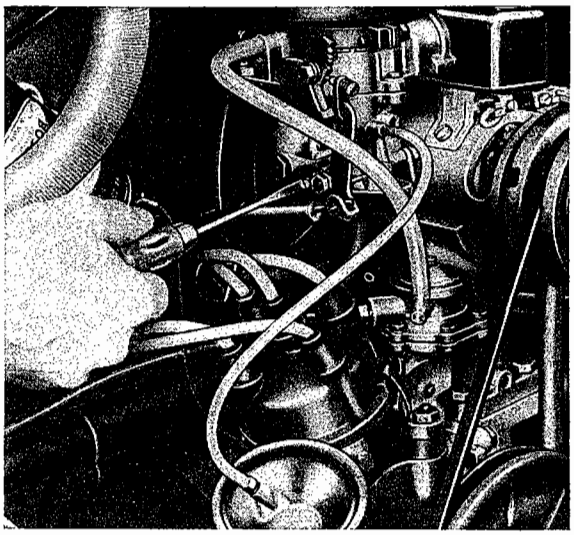
The idling adjustment may require regulating from time to time. This should be carried out when the engine is warm.

Important

Check that the idle adjusting screw is not resting on one of the steps of the fast idle cam.



1 - Set the engine idling speed to approximately 550 rpm. with the idle adjusting screw.



2 - Turn the volume control screw to the right until the engine speed begins to drop, then give it a quarter to a third of a turn to the left.

Note:

Turn the volume control screw carefully to avoid damaging the screw tip or the idle port.

3 - Regulate the idling speed as required.

The normal idling speed is usually attained with the volume control screw $1^1/_4$ to $1^1/_2$ turns from the fully closed position. Take care when closing the screw as careless handling can easily lead to the tip of the screw or the idle port being damaged. Accurate idling adjustment is of great importance as it has a considerable influence on fuel consumption in the low and medium speed ranges. In some cases the consumption can be increased by as much as $^1/_2$ litre over 100 kms (1 Imp. gallon over 560 miles or 1 U.S. gallon over 470 miles). This affect will be particularly noticeable on vehicles which are already operating under unfavourable conditions.

The adjustment is correct if the warm engine continues to run when the throttle is opened and closed suddenly or when the clutch pedal is depressed. If the engine stalls, the idling mixture is too weak and the volume control screw can be screwed out $^1/_8$ of a turn. Finally check that the transfer is smooth by operating the throttle slowly and gradually increasing the engine speed. Should the engine stall when the throttle is closed quickly, for instance when braking sharply, the idling mixture is probably too rich. If the engine idles unevenly when all the adjustment have been checked, the fault may lie in a damaged intake manifold flange gasket, a cracked or loose intake manifold or an improperly adjusted fuel pump.

Faults in the ignition system and excessive variations between the compression pressures in the individual cylinders can also have a detrimental effect on the idling.

Note:

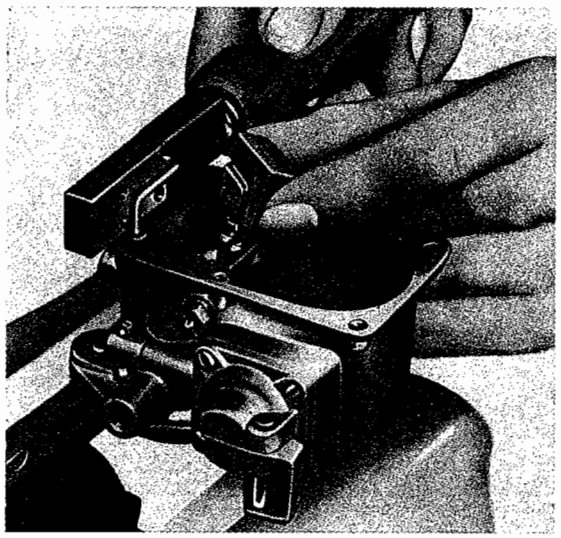
Idling adjustment on vehicles with "Saxomat"

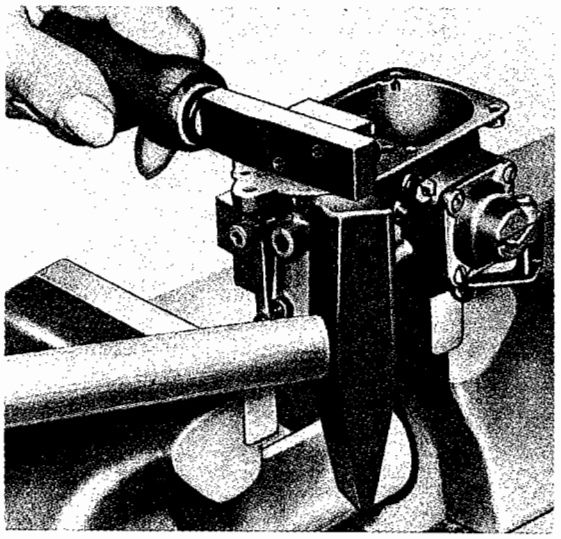
When the engine is started from cold it runs at a fast idling speed for a short time. As the starting clutch begins to grip at engine speeds over 950 rpm it is possible for a vehicle on which the handbrake is not set to start moving of its own accord as soon as a gear is engaged.

2 - This possibility can be reduced considerably by adjusting the idling speed to 500/550 rqm when the engine is warm. It is advisable to use a revolution counter when doing this as it is very difficult to estimate the speed accurately.

When the cold engine has started and been acelerated once, the idle screw will move to the 3rd or 4th step on the fast idle cam. In this position the engine speed is sufficently low to enable a gear to be selected without causing the vehicle to move, if the idling speed is properly adjusted.

3 - The section "Driving" in the "Saxomat" supplement for the Volkswagen Instruction Manual also deals with this subject. The instructions on starting vehicles with the Saxomat should be brought to the attention of all workshop staff.





Note:

It may occasionally be noticed that the 28 PICT carburetor has a "flat spot" on acceleration. This can originate from various sources:

1 - **Air cleaner warm air regulating flap in fixed position**

The warm air regulating flap in the intake tube of the air cleaner should be in the working position and move easily.

2 - **Movement of the accelerator pump lever restricted**

This is caused by the lever contacting the generator.

Remedy:

a - Loosen the four nuts on the generator support flange, push the generator to the right as far as possible and tighten the nuts in this position.

b - Move the carburetor in a similar manner as far as possible to the left on the intake manifold flange.

c - Bend the intake manifold support as necessary.

3 - **Accelerator pump discharge tube bent or dirty**

Check the operation of the accelerator pump in the carburetor:

A - When the throttle opens, the fuel should be sprayed straight down through the carburetor without touching the walls of the mixing chamber.

Remedy:

Adjust the discharge tube.

B - If the spray is uneven or varies in direction, the jet is dirty.

Remedy:

Pull out the discharge tube and replace it with a new one (Part No. 113 129 323). A tool for this purpose is being published in a supplement to VW "Local Manufacture of Workshop Equipment" under the number VW 646.

Important

Do not turn the discharge tube when removing or installing it.

Removing the discharge tube with VW 646

a - Loosen wing nuts and take off clamp jaw.

b - Position the tool so that the discharge tube is located in the recess provided.

c - Fit jaw and tighten wing nuts.

d - Pull the tube out by tapping the end of the tool with a hammer.

The new tube is installed in the reverse order.

C - The accelerator pump discharge tube (Part No. **new:** 113 129 323 A) has been provided with a slightly wider shoulder to facilitate removal with a locally manufactured tool. The special tool for the 28 PICT carburetor discharge tube — VW 646 — has been altered and redesignated VW 646/1. New drawings for the publication "Local Manufacture of Workshop Equipment" will be issued in the near future so that existing VW 646 tools can be modified.

The end piece of the discharge tube is now sealed with a grub screw and not with solder as it was formerly. Both modifications make the cleaning of the accelerator pump system easier.

Service installation in older carburetors is not possible.

4 - **Intake valve for accelerator pump leaking**

If insufficient fuel is injected by the accelerator pump, it will invariably be found that the intake valve is leaking. This can be checked by removing the top part of the carburetor body, taking out the float and putting a small quantity of fuel into the float bowl. When the pump is operated, it will be seen clearly that fuel is forced back into the float bowl from the intake opening of the pump.

Remedy:

Replace lower part of carburetor body.

5 - **Accelerator pump delivery valve sticking**

a - If the delivery valve sticks in the closed position it will not be possible to move the pump lever.

b - If the delivery valve does not close, the intake stroke of the pump will draw in air via the valve in the pump housing instead of drawing fuel from the float bowl. Fuel will only be drawn in if the hole in the discharge tube is closed with the finger.

Remedy:

Pull out discharge tube. Remove the retaining pin and take out the delivery valve ball. Clean the drilling, renew the ball and install parts.

Synthetic hose between fuel pump and carburetor

On engines up to No. 5 222 818 which are still equipped with a synthetic hose between fuel pump and carburetor, it may be found that the hose material dissolves and forms a sticky deposit in the carburetor when fuels containing alcohol are used. These carburetors should be soaked in methylated spirits for 24 hours to remove the deposit. The rubber hose — Part No. 111 209 185 A — should then be installed.

Note:

In January 1963, between the following numbers:

Chassis No.	**Engine No.**
from 5 220 713	7 350 401
to 5 250 430	7 435 393

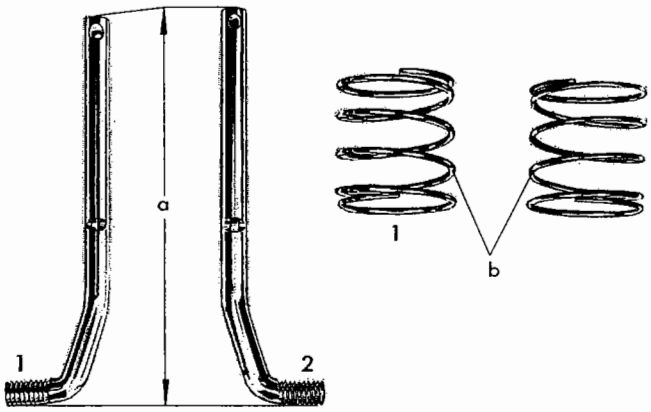
about 50000 28 PICT carburetors with an accelerator pump capacity of 1.1—1.4 cc per stroke (formerly 0.8—1.0 cc) were fitted. For this purpose, a stronger diaphragm spring new Part No. 113 129 467 A (formerly 113 129 467) is used. The larger amount of fuel injected will eliminate the transfer difficulties which occur occasionally.

After the above alteration, the normal 28 PICT carburetor was fitted again. To increase the amount injected on these carburetors, a 2 mm thick washer is fitted at the connecting rod cotter pin instead of the 1 mm thick washer (Part No. 111 129 147).

From June 1963, Chassis No. 5 578 122 (Engine No. 7 777 338), 28 PICT carburetors with the increased accelerator pump injection amount of 1.1—1.4 cc per stroke were fitted. The following parts were modified:

	Part No. new	Part No. old
Diaphragm spring	113 129 467 A	113 129 467
Connecting rod	113 129 481 A	113 129 481

The modified version begins from carburetor No. 4 028 618 and 7 918 801.



Version	Length a	Wire thickness b
1 = new	61.0 mm (2.401")	1.1 mm (.043")
2 = old	62.5 mm (2.460")	0.9 mm (.035")

Service installation

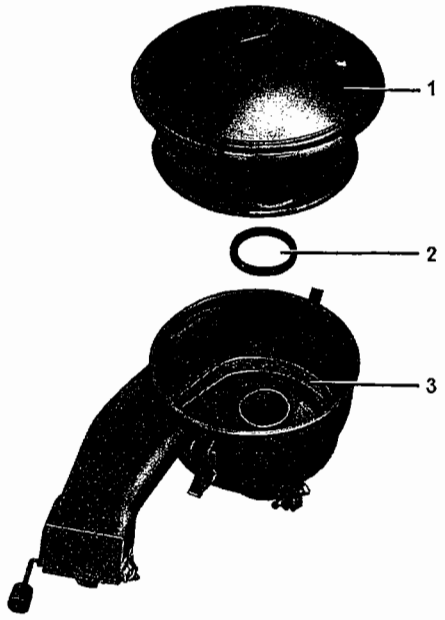
a - The stronger spring can be installed together with the former connecting rod.

b - The new connecting rod must only be installed with the stronger spring.

Parts of the previous pattern should be used up.

Air Cleaner

The oil bath air cleaner has an air intake tube which is fitted with a controllable flap valve. In the released position, that is at temperatures under 20° C (68° F) the valve is opened by the air drawn in as the engine speed increases. The valve shaft is equipped with a small weight for compensation purposes. In the fixed position — at temperatures of 20° C (68° F) and over — the air intake tube is opened and the connection for the pre-heater pipe from the left heater junction box is closed by the

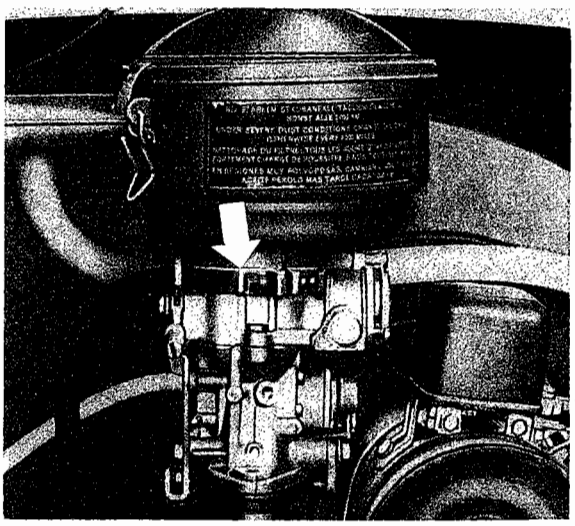


1 - Filter element 2 - Gasket 3 - Oil reservoir

valve simultaneously. This arrangement prevents carburetor icing during cold damp weather.

The **oil bath air cleaner** extracts dust and dirt from the combustion air and also acts as an intake air noise damper. The cleaner must be checked at the intervals given in the lubrication chart and the lower part cleaned as necessary. The lower part should always be cleaned if there is only 4—5 mm of oil above the layer of sludge.

In very dusty conditions, the cleaner must be checked more frequently, even daily if necessary. The lower part should then be cleaned and filled to the mark with fresh SAE 20 engine oil. When assembling the cleaner, ensure that the gasket is in good condition and located correctly.



Note:

The warm air regulating flap in the intake tube of the air cleaner should generally be in the working position. The supply of warm air at low engine speeds not only prevents the formation of ice inside the carburetor during certain typical climatic conditions. It also ensures a good pick-up on acceleration, particularly when the weather is cold, and helps to save fuel. The opinion that the engine performance is better when the flap is fixed open because the cold air fills the cylinders more completely, is of course, incorrect as the flap admits only cold air as soon as the engine has reached medium speed.

The flap should only be fixed open when the engine — with fuel with poor anti-knock qualities and encouraged by high temperatures — tends to pink when accelerating from the low speed range.

Note:

From Chassis No. 3 221 788, the connecting pipe (Part No. 113 255 359) between the left heater junction box (Part No. 113 255 101 A) and the oil bath air cleaner (Part No. 113 129 611 B) is secured at each end with a spring type hose clip (Part No. 113 255 737).

Note:

Up to September 1960, approximately 20000 oil bath air cleaners from Messrs Knecht (Part No. 113 129 611 B and 211 129 611 G) are equipped with a spring clip for holding the warm air flap on the intake tube.

If this spring clip breaks, a new one can be fitted (Part No. 113 129 614) and it is not necessary to replace the complete air cleaner.

Note:

From August 1961, the clamp on the oil bath air cleaner has a red mark which should be in line with the left rib on the upper part of the 28 PICT carburetor.

This will ensure that the cleaner is installed with the flat surface parallel to the fan housing.

Symptoms	Cause	Remedy
1 - Engine will not start (with fuel in tank and ignition in order)	a - Automatic choke not working properly	a - Check the vacuum piston for freedom of movement and, if necessary squirt easing oil through the spring housing
	b - Choke valve sticking	b - Free the choke valve shaft with easing oil
	c - Bi-metal spring unhooked or broken	c - Re-connect spring, or if broken, replace complete ceramic plate
	d - Ceramic plate broken	d - Replace ceramic plate. Note marks when installing
	e - Float needle valve sticking and carburetor flooding	e - Clean or replace float needle valve
		Important. If a large quantity of fuel has passed from the flooded carburetor into the engine, switch on the ignition and wait 1 minute before starting and then open throttle fully.
2 - Engine runs continually at a fast idle	a - Automatic choke not switching off	a - Check heater element and both connections
	b - Heater element defective	b - Replace complete ceramic plate
3 - Engine idles unevenly or stalls	a - Idling adjustment incorrect	a - Adjust idling correctly (550—600) engine revolutions or 1000 generator revolutions, with clutch pedal depressed)
	b - Pilot jet blocked	b - Clean jet
4 - Engine "runs-on" when ignition is switched off	a - Idling mixture too rich	a - Weaken idling mixture
	b - Idling speed too fast	b - Regulate idling speed
5 - Banging in the exhaust when vehicle is overrunning the engine	Idling mixture slightly weak	Enrich mixture by turning the volume control screw approximately $^1/_8$ of a turn
6 - Poor transfer from idling to normal running	a - Accelerator pump dirty (pump passages blocked, ball sticking)	a - Clean accelerator pump and check action
	b - Torn diaphragm	b - Replace diaphragm
	c - Idling adjustment incorrect	c - Adjust idling correctly

Symptoms	Cause	Remedy
7 - Engine stalls when accelerator pedal is released suddenly	Idling mixture too rich	Adjust idling correctly
8 - Engine runs unevenly (surges) with black exhaust smoke at low idling speed and smokes badly as idling speed increases. Spark plugs soot-up quickly and mis-fire	a - Excessive pressure on the float needle valve	a - Check fuel pump pressure and reduce if necessary
	b - Leaky float	b - Replace float
	c - Float needle valve not closing	c - Check needle valve and replace if necessary
9 - Engine runs unevenly at full throttle, misfires and cuts out or loses power	Fuel starvation	a - Clean main jet and power fuel system b - Clean float needle valve c - Check fuel pump pressure and increase if necessary d - Clean fuel tank and tap
10 - Excessive fuel consumption	a - Jet sizes not properly matched	a - Install correct set of jets. Check spark plug condition
	b - Excessive pressure at float needle valve	b - Check fuel pump pressure and reduce if necessary
	c - Leaky float	c - Replace float
	d - Float needle valve not closing	d - Check needle valve and replace if necessary
	e - Automatic choke not working properly	e - Check as at Point 2

Note:

A poor transfer and a tendency to stall when idling can also be caused by insufficient ignition advance, inadequate breaker point gap or dirty spark plugs. Always check ignition system when in doubt.

Removing and Installing Accelerator Cable

General

The accelerator cable passes through the frame tunnel and fan housing of the engine in a guide tube. It is attached to the accelerator pedal rod at one end and to a swivel pin in the throttle valve lever at the other.

The spring pushed over the guide tube at the fan housing returns the accelerator cable and closes the throttle. A sleeve prevents the spring from becoming deflected.

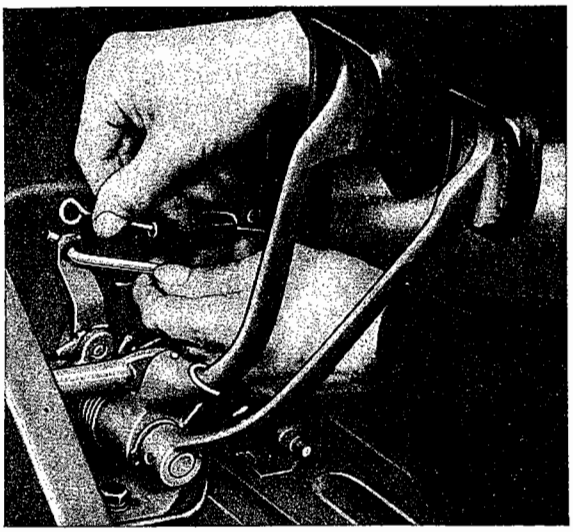
Removal

The removal and installation is facilitated by lifting the rear end of the vehicle.

1 - Disconnect accelerator cable from throttle valve lever.

2 - Compress the spring and remove spring seat. Take off sleeve and spring.

3 - Detach bolt from accelerator pedal and disconnect cable from bolt.



4 - Pull accelerator cable out of the guide tube in the fan housing towards the front.

5 - Take off rubber boot at the end of the cable guide tubes in the frame.

6 - Pull the accelerator cable towards the front out of the guide tube.

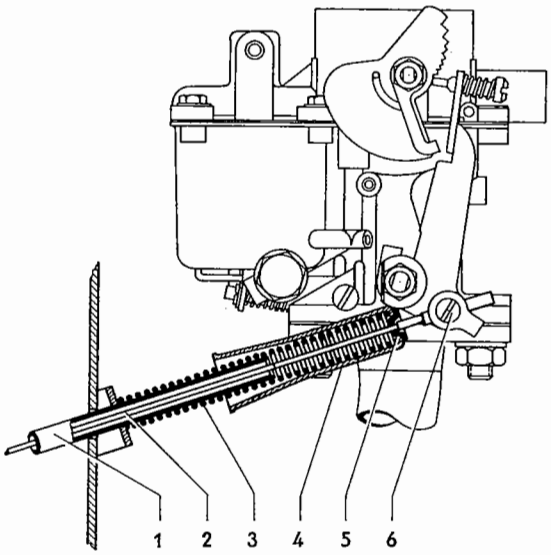
Installation

When installing, the following points should be noted:

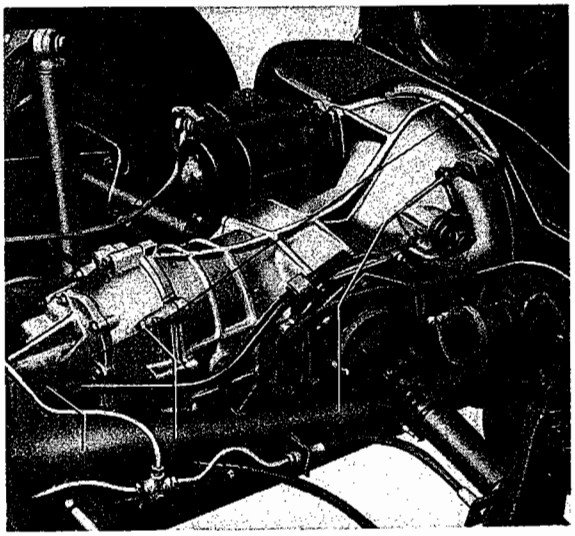
1 - Grease accelerator cable with universal grease.

2 - The accelerator cable must be laid straight between the guide tubes.

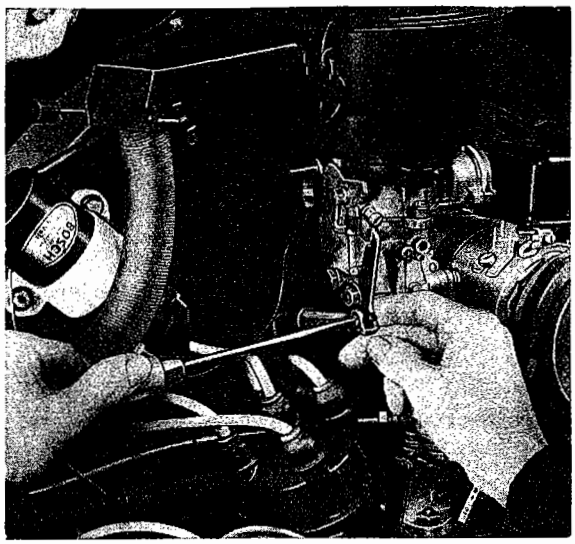
3 - Make sure that the rubber boot is correctly seated to prevent water entering the guide tube.



1 - Accelerator cable guide tube
2 - Accelerator cable
3 - Accelerator cable spring
4 - Spring sleeve
5 - Spring seat
6 - Accelerator cable swivel pin

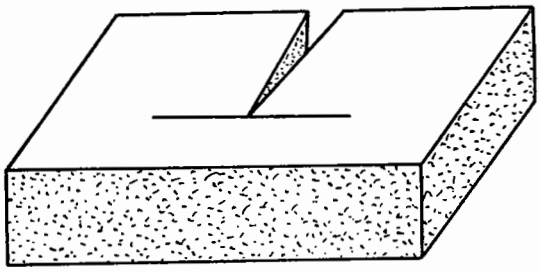


1 - Rubber boot 2 - Accelerator cable 3 - Clutch cable



4 - Special care must be taken when attaching the accelerator cable to the throttle valve lever, as otherwise undue tension may occur at full throttle, leading to breakage of the cable. Open throttle valve so that there is a clearance of about 1 mm (.04") between throttle lever and stop at carburetor body. Fully depress accelerator pedal and connect cable to throttle valve.

Accelerator Cable and Accelerator Pedal

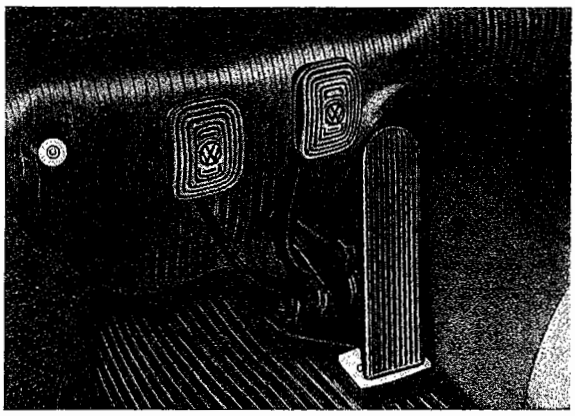


Length: 65 mm (2.6")
Width: 35 mm (1.4")
Height: 15 mm (.6")

Sticking of the accelerator pedal hinge caused by snow and dirt accumulations can generally be avoided by greasing the hinge well. Under severe conditions a more effective remedy can be obtained by covering the hinge with a PVC foam rubber strip.

1 - Cut out a piece of water-repellent PVC foam rubber and provide it with a T-shaped slit.

2 - The portion of the strip situated under the accelerator pedal should be about 12—15 mm (.5"—.6") wide.



3 - Coat the strip with adhesive and position it round the accelerator pedal so that the leg of the T points in the direction of travel and the cross of the T is positioned on and parallel to the hinge pin.

4 - The opening in the floor mat should be trimmed accordingly.

If the accelerator cable has become frozen in the guide tube due to the formation of condensation, remove it, blow out the guide tube with compressed air and re-install the cable after greasing it well. Ensure that the carburetor linkage is well lubricated.

Note:

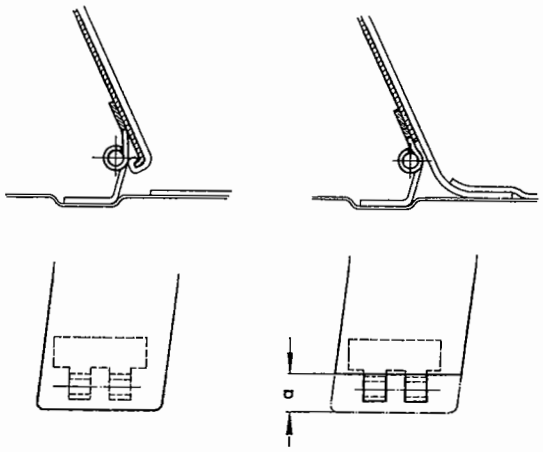
During the winter, the accelerator movement on vehicles from Chassis No. 1 600 440 can become restricted by the build-up of hard snow beneath the pedal hinge. The following modification can be made to prevent this from occurring:

1 - Remove accelerator pedal.

2 - Shorten the pedal plate at the bottom by approximately 13 mm as shown in drawing.

3 - Bend the hinge until the eye is level with the pedal plate and cement a new rubber cover (Part No. 113 721 647 A) into position.

4 - Install pedal and tuck end flap of the new rubber cover underneath the floor covering.



a = 13 mm (.5")

Note:

From Chassis No. 3 405 001 the accelerator pedal hinge was raised and the rubber cover lengthened at the bottom. The new version (Part No. 111 721 507 B — RH drive 113 721 507 B) prevents the pedal hinge from becoming blocked by ice and snow.

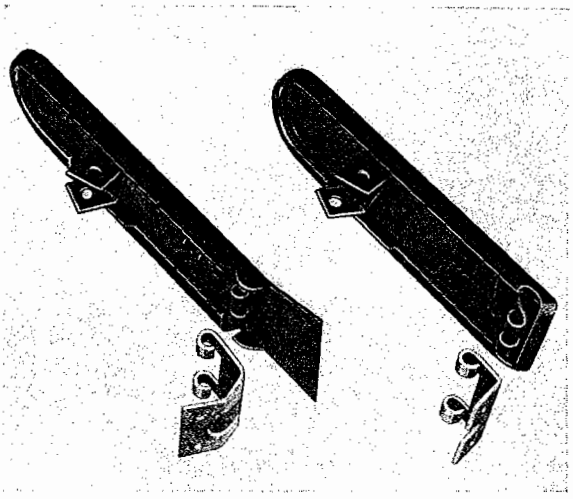
It can be installed in vehicles from Chassis No. 1 600 440 (1 st August 1957) as follows:

1 - Remove accelerator pedal.

2 - Drill out the hinge spot welds.

3 - Drill 6.2 mm (.25") holes at the spot weld bosses in the new hinge (Part No. 111 701 535 A) and secure it to the floor plate with two M 6×15 mm screws. Install a rubber packing under the hinge to prevent leaks.

4 - Cement a new rubber cover (Part No. 113 721 647 A to the pedal plate and tuck the extended flap underneath the floor covering.



New Old

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The upper and lower parts are held together by five screws and a gasket is fitted between the two parts.

The connection pipe for the fuel line and the power fuel pipe are pressed into the upper part and the float needle valve is screwed into it. An angled drilling ventilates the float chamber to the air intake flange.

The automatic choke is installed in a small housing cast on to the upper part. The main parts of the automatic choke are the choke valve, choke valve shaft with a two-arm lever riveted to it and the freely mounted fast idle cam with the operating lever.

The lever on the choke valve shaft engages in a recess in the pull rod for the vacuum diaphragm which is connected via a drilling to the vacuum below the throttle valve. As the vacuum increases, the diaphragm opens the choke valve slightly.

The automatic choke is closed with a ceramic cover in which are the heater element and the bi-metal spring.

The lower part of the carburetor contains the mixing and float chambers, the float and all the parts necessary for the preparation of the fuel/air mixture. At the bottom of the mixing chamber is the throttle valve shaft with the throttle valve which is operated by the throttle valve lever.

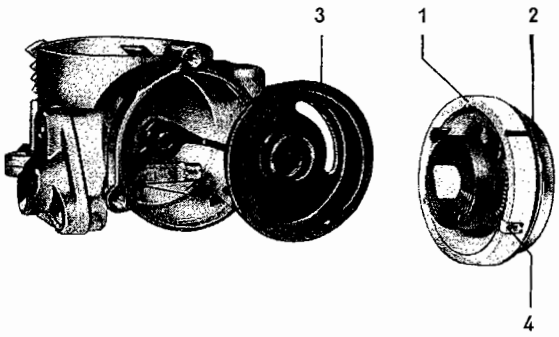
The accelerator pump is located in a housing cast on to the float chamber and is connected to the throttle valve shaft via the connecting link and the pump lever.

The function of the idling circuit is that of an auxiliary carburetor which takes over the preparation of the mixture when the throttle valve is almost closed. The idling mixture can be enriched or weakened by means of the volume control screw. The engine idling speed is controlled by the idle adjusting screw. The fast idle cam increases the idling speed as the choke valve closes when starting from cold and decreases it as the engine warms up.

Operation

Automatic Choke

The automatic choke provides a rich mixture for the cold engine, dependent on the outside temperature, and weakens the mixture gradually as the engine warms up. Furthermore, it increases the idling speed as long as the engine is not properly warm. This makes it possible to start and run the cold engine satisfactorily until it is thoroughly warmed up. The operation of the choke is fully automatic.

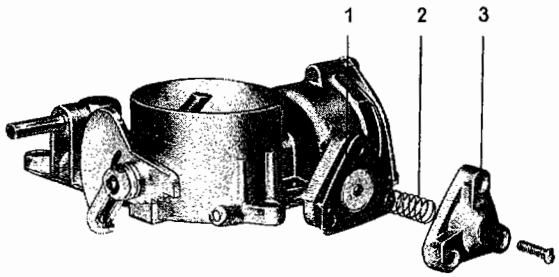


The choke unit (1) is of ceramic material and is insulated externally by a metal cap (2). Inside the unit is a heater element and a bi-metal spring which has a hook-shaped outer end. A plastic insert (3) in the choke housing provides lateral support and heat insulation for the bi-metal spring. A ceramic rod (4) prevents the heater element from coming into contact with the bi-metal spring.

At low temperatures the bi-metal spring commences to uncurl and this movement is transmitted by the hooked end of the spring to the angled arm of the lever riveted to the choke valve shaft. This closes the choke valve and the engine receives the rich mixture required when starting from cold.

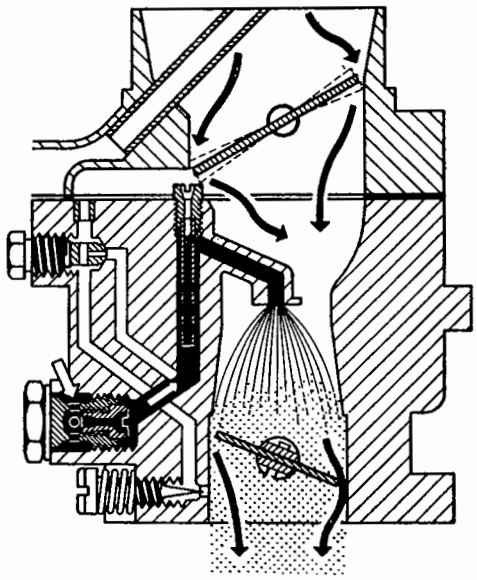
The rotary movement of the choke valve shaft is also transmitted to the operating lever which moves the fast idle cam. The closing force of the bi-metal spring thus turns the fast idle cam to a position where the idling screw rests on the highest step of the cam, when the accelerator pedal is released. According to the degree of force exerted by the bi-metal spring, the idling screw may come to rest on one of the six steps on the cam. This opens the throttle slightly and increases the idling speed. As the closing effort decreases due to the increasing heat, the fast idle cam turns so that the idling screw rests on the lower step and the engine runs at the normal idling speed.

Several forces work together to open the choke valve. As a result of the off center mounting of the choke valve shaft in the air intake flange of the carburetor, the flaps of the choke valve are of different sizes. The larger flap moves downwards as it opens so that the flow of air being drawn in tends to force the choke open. At the same time, the closing effort of the bi-metal spring is reduced by the heat from the heater element. When the ignition is switched on, the heater element receives current via a cable from terminal 15 on the coil to the tab connector on the automatic choke cover. The choke valve takes about 2 to 3 minutes to open fully after the ignition has been switched on.



1 - Vacuum diaphragm
2 - Diaphragm spring
3 - Cover for vacuum diaphragm

The choke valve is also open slightly against the tension of the bi-metal spring by the vacuum diaphragm (1). On one side of the vacuum diaphragm is a drilling which leads to below the throttle valve. As soon as the throttle valve is opened slightly there is a high vacuum at this point and this actuates the diaphragm. The pull rod attached to the diaphragm engages the arm of the lever on the choke valve shaft and opens the choke. This ensures that the rich mixture is automatically weakened to suit the engine conditions.



Before starting an engine from cold, the accelerator pedal must be depressed once so that the bi-metal spring can close the choke valve and enable the automatic choke to work properly. The starter must be operated as soon as the ignition is switched on so that the choke valve cannot open prematurely due to the heat from the heater element.

When starting the engine from cold, the vacuum effective under the choke valve lifts fuel from the emulsion tube into the mixing chamber via the discharge arm. The air required for the formation of the mixture is drawn in past the choke valve which is then opened slightly by the vacuum. The tension of the bi-metal spring closes the choke valve so that it alternates between open and closed when starting. This gives a rich starting mixture which ensures easy starting even at very low temperatures. The vacuum building up at the throttle valve then starts to move the diaphragm so that the choke valve opens further.

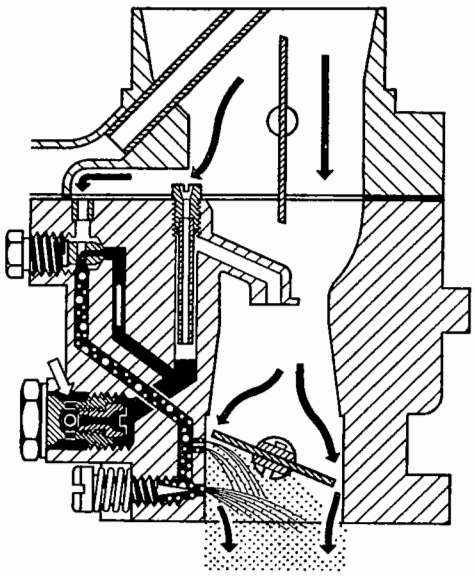
This prevents the starting mixture from becoming excessively rich. The choke valve is then opened fully by the bi-metal spring as it warms up and the mixture automatically weakens to suit the operating conditions of the engine.

If the accelerator pedal is released when moving off, the idling adjustment screw rests on one of the steps on the fast idle cam and ensures that the engine continues to run at a fast idling speed. The engine does not run at the pre-set idling speed when the accelerator pedal is released until the idling screw is resting on the lowest step.

Idling operation

At idling speed, the mixture takes place in a different manner. When the throttle is almost closed the air speed, and consequently, the vacuum in the venture is so low that no fuel will be drawn out of the discharge arm. The engine now gets the mixture from the idling system.

The fuel flows from the float chamber through the main jet into a drilling leading up to the pilot jet. Air is drawn via the pilot air bleed drilling above this jet. The idling mixture thus created passes through a drilling leading downwards to the volume control screw and the discharge opening below the throttle valve. The air passing by at high speed draws the idling mixture out of the discharge hole. The idling mixture can be enriched or weakened with the volume control screw. The adjustment of this screw is, therefore, very important.



The idling adjustment also includes the idling speed of the engine. This setting must be correct so that the speed is not too high or too low. This part of the adjustment is made with the idling screw which alters the position of the throttle valve at idling.

When the throttle valve is opened slightly and the idling speed thus increased, the engine requires more fuel. The vacuum zone which is effective at the throttle valve gap moves up into the area near the by-pass ports which are situated just above the idle port and are connected to the idling mixture drilling. Additional idling mixture is drawn from the by-pass ports and this helps to improve the transfer from the idling circuit to the main jet system.

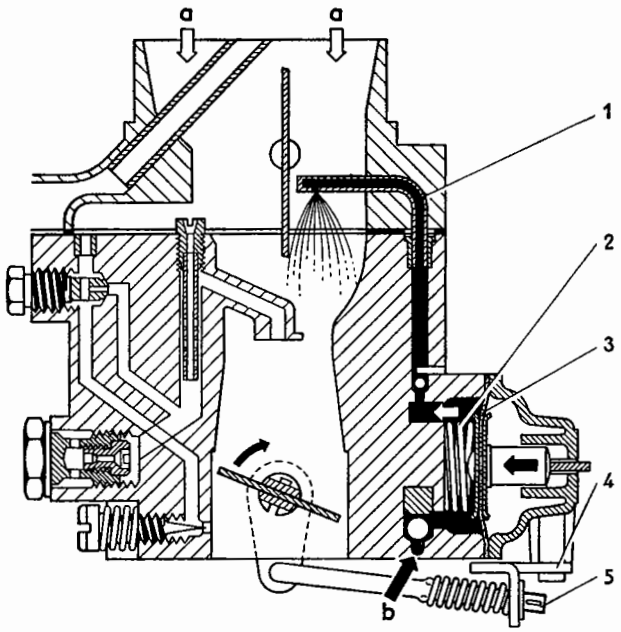
Normal operation

During normal operation the vacuum in the intake passage draws the fuel out of the spraying arm which is connected to a vertical well containing the air correction jet with the emulsion tube pressed into it. Fuel flows to this well from the float chamber via the main jet.

The factors governing the amount of vacuum are the size of the venturi, the engine speed and the throttle opening. The specially designed restriction of the venturi — where the spraying arm ends — has an accelerating effect on the air being drawn in by the engine. This gives — in connection with the position of the throttle valve — a varying degree of vacuum and draws different quantities of fuel from the spraying arm. As the fuel level in the emulsion tube drops due to the rising vacuum created by the increasing throttle opening, air is simultaneously drawn in through the air correction jet. This air passes out of the holes in the emulsion tube as they are uncovered and mixes with the fuel flowing from the main jet, thus progressively weakening the mixture as the engine speed increases.

Accelerator Pump

The accelerator pump is operated from the throttle shaft by a connector rod and pump lever. When the throttle valve is closed, the diaphragm spring presses the pump diaphragm to the rest position and the chamber in front of the diaphragm fills with fuel drawn in from the float chamber via a ball valve.

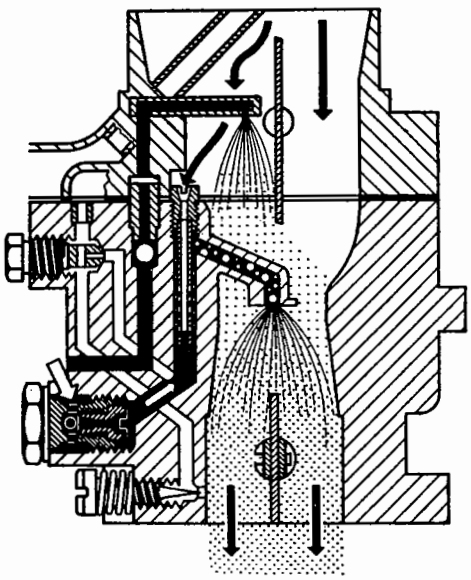


a - Air
b - Fuel from float chamber
1 - Injection tube
2 - Pump spring
3 - Pump diaphragm
4 - Pump lever
5 - Connecting rod

When the throttle valve is opened, the movement is transmitted to the diaphragm through the linkage. The pressure stroke of the pump opens a ball check valve in the delivery passage and fuel is forced through a calibrated discharge tube into the mixing chamber. Injection begins when the throttle is opened and ends at an opening angle of about 30°. This additional fuel enriches the mixture and ensures a smooth transfer and rapid acceleration.

The accelerator pump enriches the mixture in the low and medium speed range only, as the spring on the connecting rod holds the diaphragm in the depressed position as the throttle is opened further and prevents the pump from refilling with fuel until the throttle is almost closed again.

Power Fuel System



The power fuel system provides a richer mixture at full load and high engine speeds to enable the engine to give its maximum output. A calibrated power fuel tube is pressed into the upper part of the carburetor and connected by a drilling to the float chamber. The tube ends above the discharge arm in an area where the vacuum is reduced. At low and medium revolutions the vacuum is not high enough to draw fuel out of the power fuel tube. The additional fuel supply from the power fuel system only commences when the engine speed and the vacuum is high.

Under these operating conditions, the mixture is enriched by fuel which is supplied through the accelerator circuit. The vacuum at the end of the injection tube is now so large that fuel is drawn from the float chamber through the accelerator pump.

Oil Bath Air Cleaner

The oil bath air cleaner consists of the upper part with the filter element and the lower part with the air intake tube. The two parts are held together by two quick-release clips.

In the air intake tube in the lower part is a small flap valve which controls the flow of fresh or pre-heated air in accordance with the speed of the engine. The flap is fitted with a balance weight so that at low speeds only preheated air can center the carburetor. The warm air is taken from the engine cooling air near the left rear exhaust elbow and passes through a hose to the air intake tube on the cleaner. In this manner, the carburetor receives only pre-heated air at idling and medium speeds and this helps to prevent the formation of ice in the carburetor. As the engine speed increases and more air is drawn in, the air stream presses the flap valve down against the weight and cuts off the intake of pre-heated air so that the carburetor draws in only cold air. Only in exceptional cases when the outside temperature is very high should the flap be fixed so that the intake of warm air is closed continuously.

The lower part of the air cleaner is fitted with an adaptor pipe which is connected with a hose to the oil filler and gives crankcase ventilation.

The air cleaner filters the dust and dirt out of the air drawn in by the engine and also acts as an intake air noise damper. The cleaner must be checked at the intervals given in the lubrication chart and the lower part cleaned as required. The lower part should always be cleaned when there is only 4—5 mm of clear oil above the sludge layer.

In very dusty conditions the cleaner must be checked more frequently, even daily if necessary. The lower part should then be cleaned as required and filled with fresh oil.

Note:

The securing clip on the air cleaner has a red mark which should be in line with the left rib on the upper part of the carburetor. This ensures that the flat part of the cleaner is parallel to the fan housing.

Note:

5/66

From May 1966

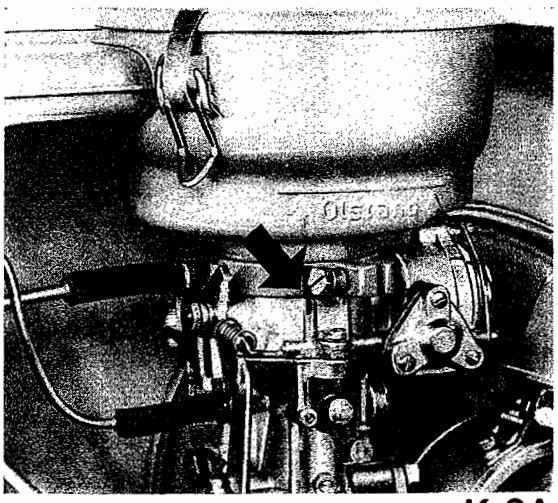
Type	Chassis No.	Engine No.
1/1200	116 807 190	D 0 079 454
1/1300	116 852 850	F 0 767 046

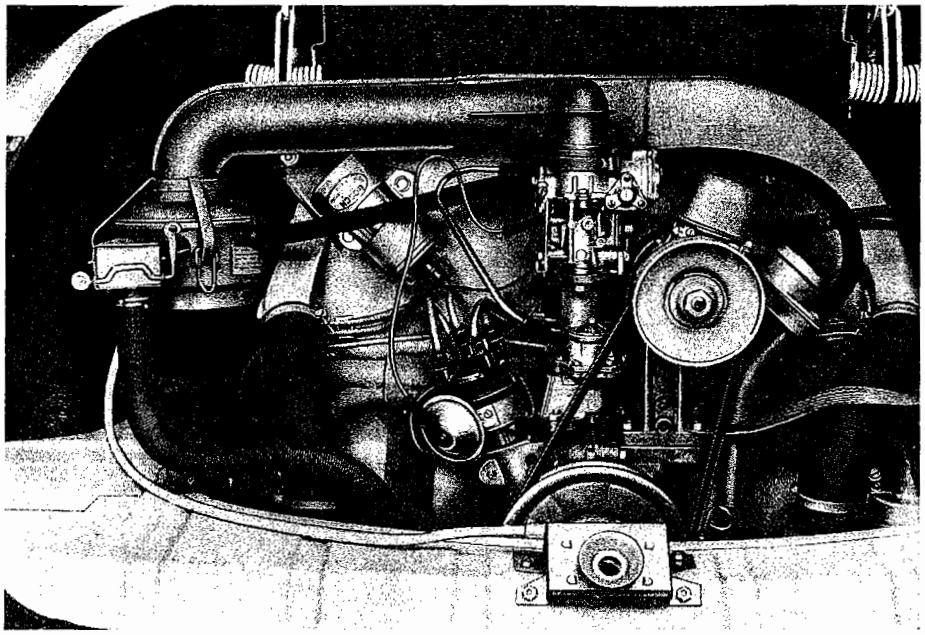
all vehicle engines are fitted with a modified carburetor pre-heating system. The warm air is taken from the left heat exchanger except on the 14 Models where it is taken from the right side.

At temperatures below +10° C (+50° F) the balance-weighted flap in the intake of the oil bath air cleaner must be free to operate on its own.

If higher temperatures prevail, the flap should be held in position to cut off the hot air flow. To do this, the flap lever is pushed down past the folded edge of the air intake or the control box.

If these measures are not carried out, the engine can tend to pink if the vehicle is operated for longer periods at high outside temperatures and the engine performance will be reduced.

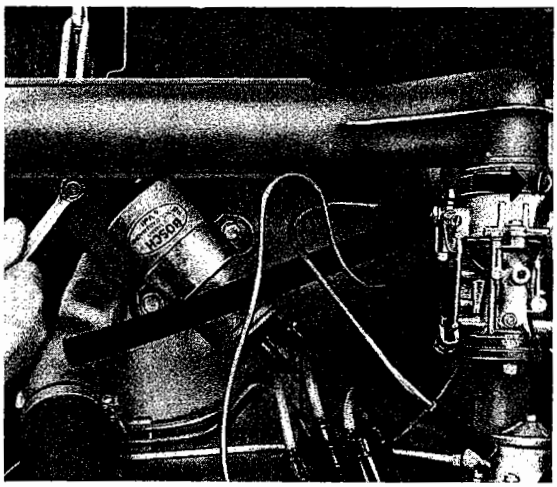




Removal of Intake Elbow

Contrary to the other 1200 Volkswagen Models, the Karmann Ghia models have a suspended cleaner which is connected to the carburetor with an elbow.

The intake elbow must always be removed before taking off the top part of the carburetor or the complete carburetor. The same applies when removing and installing the engine.



Removal

1 - Remove pre-heating pipe from air cleaner intake tube.

2 - Pull crankcase breather pipe off air cleaner.

3 - Release the clips and take air cleaner off elbow.

4 - Loosen elbow securing screw at carburetor.

5 - Remove screw at air cleaner retainer and take cleaner support off.

6 - Lift elbow off.

The air cleaner retainer can be taken off after removing the ignition coil.

Installation

When installing, note the following:

1 - Install intake elbow on carburetor upper part and ensure that it seals properly.

2 - Do not overtighten the screw on the carburetor end of the elbow as this can distort the upper part of the carburetor and make the choke valve shaft stiff in operation.

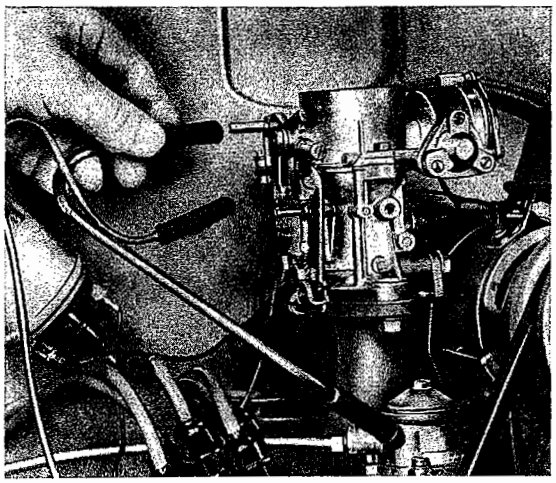
Removal

1 - Remove pre-heater pipe from air cleaner intake tube.

2 - Pull crankcase breather pipe off air cleaner.

3 - Loosen clamp screw on cleaner and take cleaner off.

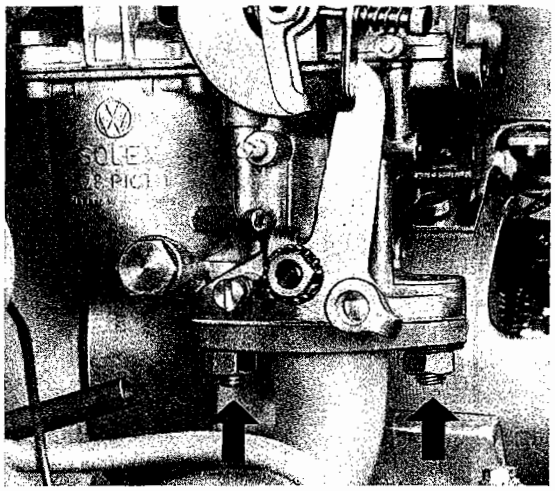
4 - Take fuel hose and vacuum hose off carburetor.



5 - Pull automatic choke cable off tab.

6 - Detach accelerator cable from throttle valve lever and take off spring, spring plate and cable pin.

7 - Remove two nuts and take carburetor off.



Installation

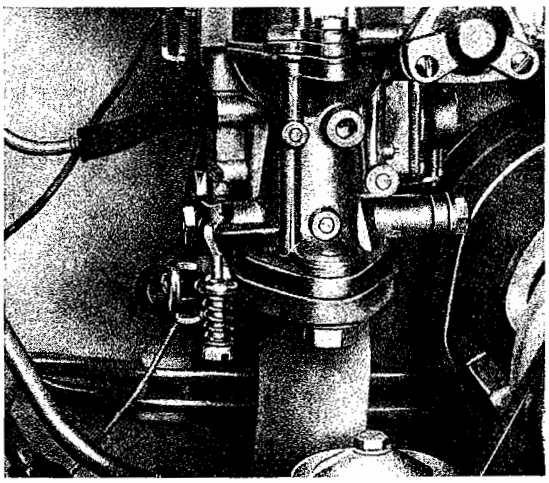
When installing, note the following:

1 - Fit a new gasket on intake manifold flange.

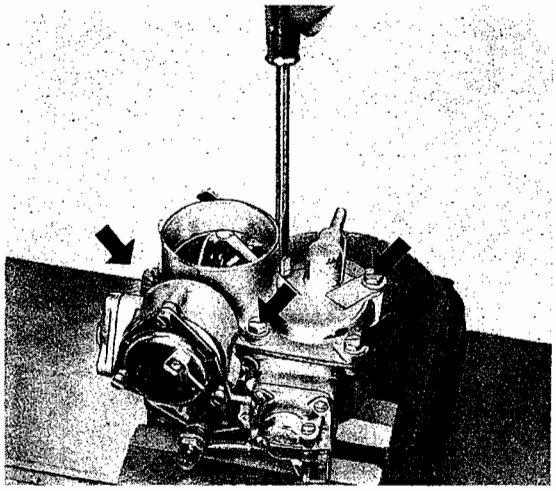
2 - Tighten nuts evenly but do not overtighten.

3 - Secure accelerator cable so that there is 1 mm play between throttle valve lever and the stop on the carburetor body when the accelerator pedal is fully depressed.

4 - Set the idling when the engine is warm.



Disassembly and Assembly of Carburetor



1 - Remove carburetor.

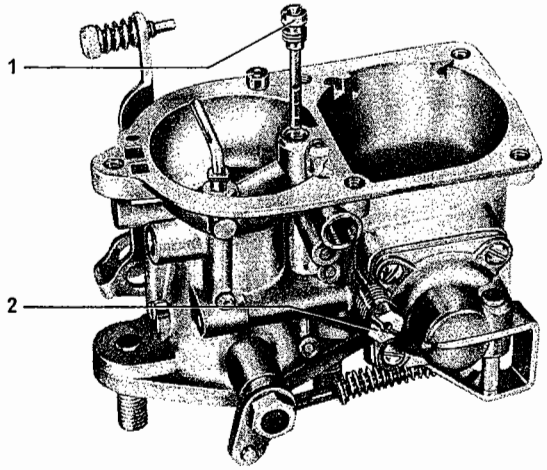
2 - Remove the five screws securing the upper part and lift it off.

3 - Take float out.

4 - Screw float needle valve out of upper part.

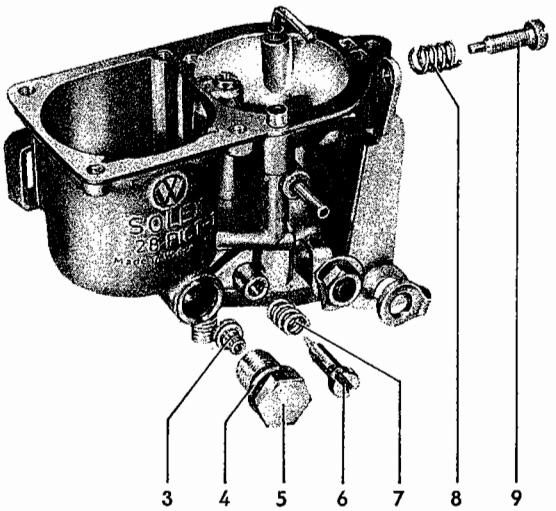
5 - Remove the three screws in the automatic choke and take off retaining ring and distance pieces.

6 - Take off the ceramic plate, bi-metal spring, heater element and plastic cap.



7 - Screw out the air correction jet with the emulsion tube and the pilot jet.

1 - Air correction jet with emulsion tube
2 - Pilot jet

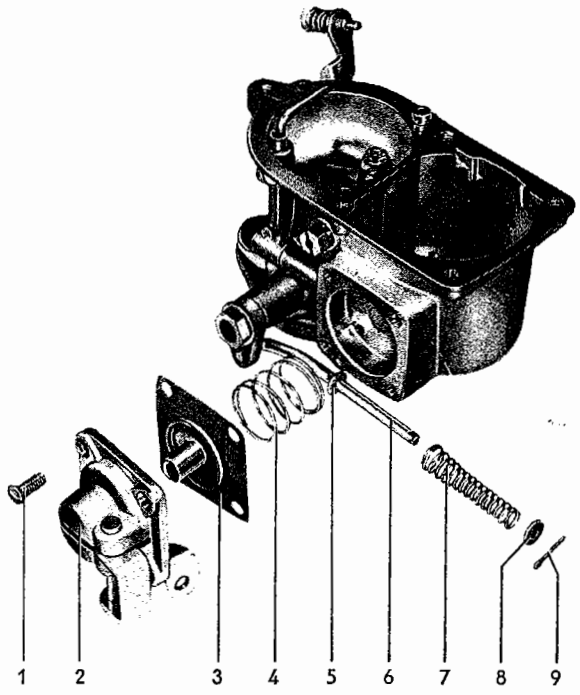


8 - Screw out the main jet carrier with main jet and the volume control screw.

3 - Main jet
4 - Gasket
5 - Main jet carrier
6 - Volume control screw
7 - Spring
8 - Spring
9 - Idle adjusting screw

9 - Remove pump lever cotter pin from the connector rod.

10 - Remove four pump cover retaining screws and take off cover, diaphragm and spring.



1 - Screw
2 - Pump cover
3 - Pump diaphragm
4 - Diaphragm spring
5 - Washer
6 - Pump connector rod
7 - Spring for connector rod
8 - Washer
9 - Cotter pin

Cleaning

1 - Clean all parts in gasoline with the exception of the cover for the automatic choke.

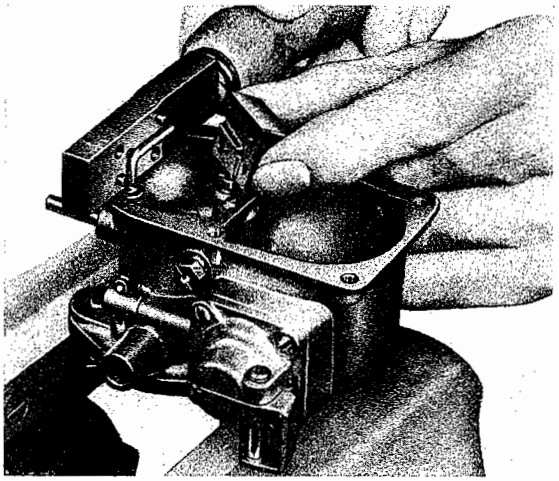
2 - Clean jets, valves in accelerator system and drillings with compressed air.

Under no circumstances should pins or pieces of wire be used to clean the jets as they will damage or enlarge the calibrated drillings.

Removal of accelerator pump discharge tube

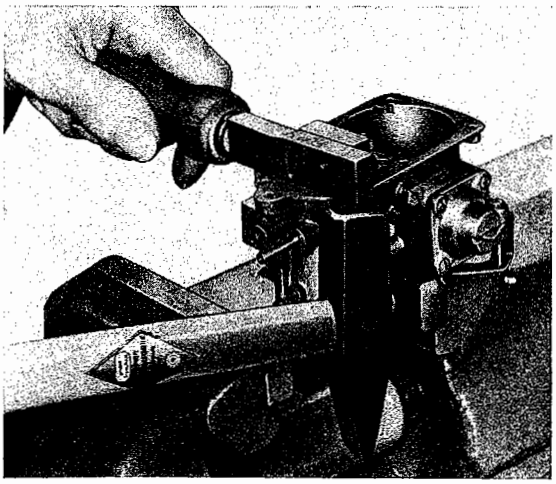
1 - Loosen wing nuts of VW 646/1 clamp (local manufacture) and take off clamp jaw.

2 - Position the tool so that the discharge tube is located in the recess provided.



3 - Fit jaw and tighten wing nuts.

4 - Pull the tube out by tapping the end of the clamp with a hammer. Do not turn the tube when removing or installing.



5 - Install a new discharge tube and check direction of spray. When the throttle opens, the fuel should be sprayed straight down past the throttle valve. If this is not so the tube should be aligned properly.

Checking and Assembling

Note the following points when checking the various parts:

Upper part:

1 - Check float needle valve for leakage. When the needle is pressed lightly on to the seat, it should not be possible to blow air through the valve.

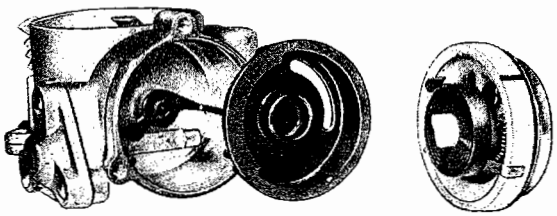
2 - Check condition of needle valve gasket and location when installed.

3 - Check gasket between upper and lower parts.

4 - Check choke valve shaft and fast idle cam for freedom of movement.

5 - Check heater element and bi-metal spring. If one of these parts is damaged the complete cover must be replaced.

6 - The lug on the plastic insert must engage in the notch in the automatic choke housing.

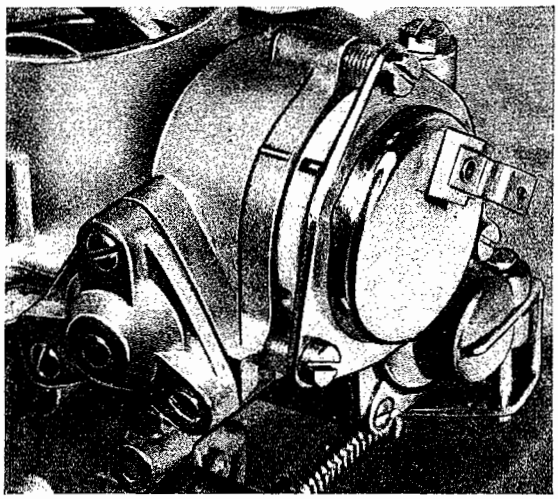


7 - When fitting the ceramic cover, ensure that the ceramic rod between heater element and bi-metal spring is located properly.

8 - The operating lever must engage the hooked end of the bi-metal spring when the cover is installed.

9 - Install outer cap and retaining ring with three screws and distance pieces.

10 - Turn the cap until the mark on the ceramic cover is in line with the lug on the automatic choke housing. Do not overtighten the screws.



11 - Oil the fast idle cam on the choke valve shaft lightly.

Lower part:

1 - Check pump diaphragm for leakage and replace if necessary.

2 - When tightening the screws for the pump cover, the pump lever should be pressed away from the float chamber so that the diaphragm is secured in the pressure stroke position.

3 - Test float for leakage by immersing it in hot water. If bubbles appear, the float is leaking and must be replaced.

4 - Check jet sizes and float weight with the data list.

When replacing jets, floats or valves, use only parts marked "SOLEX".

5 - Check throttle shaft clearance.

Excessive clearance encourages the ingress of secondary air and has a detrimental affect on starting and idling. If necessary, the holes for the throttle shaft must be bushed.

6 - Check volume control screw. The tapered portion must not be grooved, bent or pressure marked.

7 - Install float.

8 - Check position of accelerator pump injector tube in the carburetor bore. When the throttle is opened, the fuel jet must be sprayed straight down past the throttle valve. If necessary, align the tube properly.

Every carburetor is tested at the factory and adjusted on the engine to suit branded fuels. Any alteration in the settings such as replacing the jets by other than the prescribed sizes is detrimental under normal operating conditions and should be avoided. When changing from ordinary fuel to a premium mixture it is generally only necessary to adjust the idling speed.

Specifications

Venturi	22.5 mm dia.
Main jet	122.5
Air correction jet (with emulsion tube)	130 y (145 y for Ghia models)
Pilot jet	g 55
Pilot air bleed	2.0 mm dia.
Pump jet	0.5
Power fuel jet	1.0
Float needle valve	1.5 mm
Float weight	5.7 g
Pump delivery quantity	1.1—1.4 cc/stroke

Idling adjustment

The idling adjustment requires resetting from time to time. This should only be attempted when the engine is warm, making sure that the idle adjusting screw is not resting on one of the steps on the fast idle cam.

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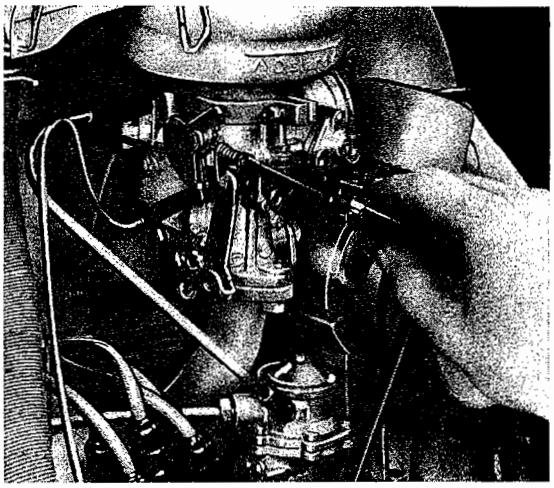
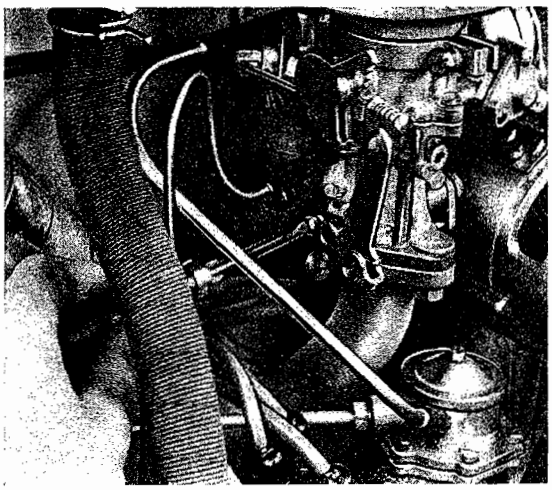
1 - Set the idling speed to about 700—800 rpm with the idle adjusting screw.

2 - Turn volume control screw in slowly until the engine speed begins to drop, then turn the screw out until the engine runs smoothly. Then turn the volume control screw out about 1/4 of a turn.

3 - The idling adjustment is correct if the warm engine continues to run after the throttle has been opened and closed suddenly with the clutch pedal depressed.





Idling adjustment on vehicles with "Saxomat"

1 - When the engine is started from cold it runs at a fast idling speed for a short time. As the starting clutch begins to grip at engine speeds over 950 rpm it is possible for a vehicle on which the handbrake is not set, to start moving of its own accord as soon as a gear is engaged.

2 - This possibility can be reduced considerably by adjusting the idling speed to 500/550 rpm when the engine is warm. It is advisable to use a revolution counter when doing this as it is very difficult to estimate the speed accurately.

When the cold engine has started and been acelerated once, the idle screw will move to the 2nd step on the fast idle cam. In this position the engine speed is sufficiently low to enable a gear to be selected without causing the vehicle to move, if the idling speed is properly adjusted.

Carburetor Trouble Shooting

Symptoms	Cause	Remedy
1 - Engine will not start (with fuel in tank and ignition in order)	a - Automatic choke not working properly	a - Check the vacuum diaphragm for freedom of movement
	b - Choke valve sticking	b - Free the choke valve shaft with easing oil
	c - Bi-metal spring unhooked or broken	c - Re-connect spring, or if broken, replace complete ceramic plate
	d - Ceramic plate broken	d - Replace ceramic plate. **Note marks when installing**
	e - Float needle valve sticking and carburetor flooding	e - Clean or replace float needle valve
		Important: If a large quantity of fuel has passed from the flooded carburetor into the engine, switch on the ignition and wait 1 minute before starting and then open throttle fully.
2 - Engine runs continually at a fast idle	a - Automatic choke not switching off	a - Check heater element and both connections
	b - Heater element defective	b - Replace complete ceramic plate
3 - Engine idles unevenly or stalls	a - Idling adjustment incorrect	a - Adjust idling correctly
	b - Pilot jet blocked	b - Clean jet
4 - Engine "runs-on" when ignition is switched off	a - Idling mixture too rich	a - Weaken idling mixture
	b - Idling speed too fast	b - Regulate idling speed
		c - Fit electro-magnetic cut-off valve if necessary
5 - Banging in the exhaust when vehicle is over-running the engine	Idling mixture slightly weak	Enrich mixture by turning the volume control screw approximately $^1/_8$ of a turn
6 - Poor transfer from idling to normal running	a - Accelerator pump dirty (pump passages blocked, ball sticking)	a - Clean accelerator pump and check action
	b - Torn diaphragm	b - Replace diaphragm
	c - Idling adjustment incorrect	c - Adjust idling correctly

Symptoms	Cause	Remedy
7 - Engine stalls when accelerator pedal is released suddenly	Idling mixture too rich	Adjust idling correctly
8 - Engine runs unevenly (surges) with black exhaust smoke at low idling speed and smokes badly as idling speed increases. Spark plugs soot-up quickly and mis-fire	a - Excessive pressure on the float needle valve	a - Check fuel pump pressure and reduce if necessary
	b - Float leaking	b - Replace float
	c - Float needle valve not closing	c - Check needle valve and replace if necessary
9 - Engine runs unevenly at full throttle, misfires and cuts out or lacks power	Fuel starvation	a - Clean main jet and power fuel system b - Clean float needle valve c - Check fuel pump pressure and increase if necessary d - Clean fuel tank and tap
10 - Excessive fuel consumption	a - Jet sizes not properly matched	a - Install correct set of jets. Check spark plug condition
	b - Excessive pressure at float needle valve	b - Check fuel pump pressure and reduce if necessary
	c - Float leaking	c - Replace float
	d - Float needle valve not closing	d - Check needle valve and replace if necessary
	e - Automatic choke not working properly	e - Check as at Point 2

Note:

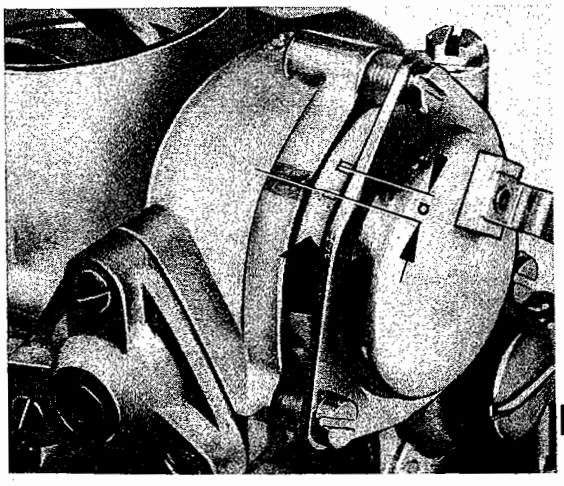
A poor transfer and a tendency to stall when idling can also be caused by insufficient ignition advance, inadequate breaker point gap or dirty spark plugs. Always check ignition system when in doubt.

Note:

In some 28 PICT-1 carburetors the bi-metal spring in the automatic choke is tensioned too much even though the marks are aligned properly. This makes the choke open late and gives a very rich mixture. When starting from cold this, in turn, causes excessive smoke at the exhaust and uneven engine running.

This trouble can be eliminated by turning the ceramic cover of the automatic choke about 4—5 mm to the right (a). This opens the choke earlier and weakens the fuel-air mixture.

a = 4—5 mm

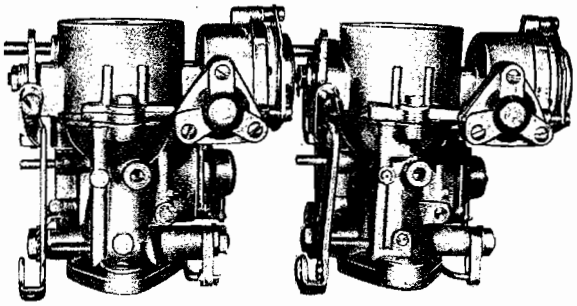


Note:

On some 28 PICT-1 carburetors of a certain manufacturing series (only version 2) it may be found that the power fuel system does not work properly. The result is that on some Volkswagen 1200 De Luxe Sedans and Convertibles, the top speed is considerably lower than the specified 115 kph (72 mph).

When complaints of this nature are received, the first thing to do is to check the engine and fuel system settings and rectify as necessary. If the engine output remains low, the carburetor itself should be checked carefully. Carburetors of version 2 should then be replaced by carburetors of version 1 of the same type — Part No. 113 129 023 J.

The defect has been eliminated from Engine No. 9 074 380.

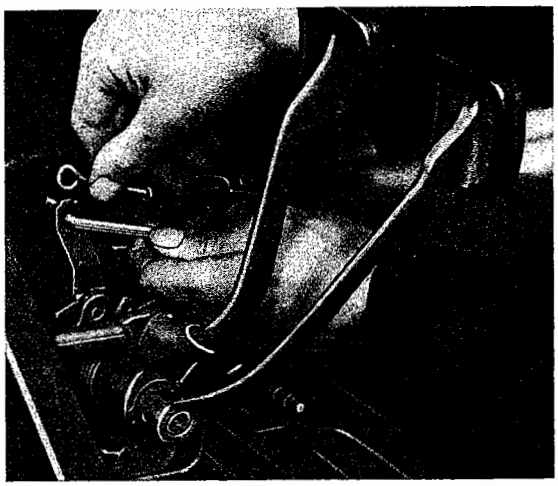


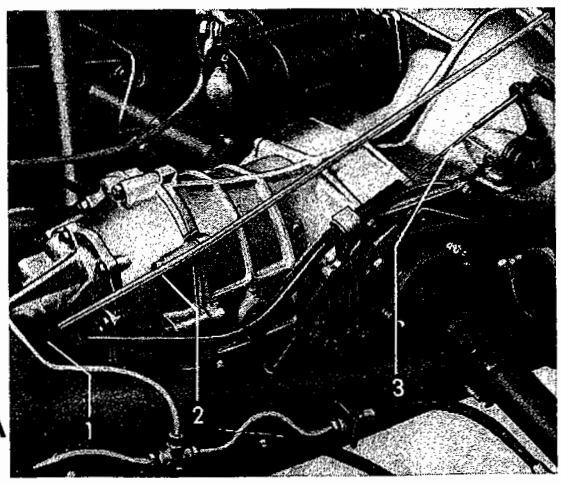
Version 1 Version 2

Removing and Installing Accelerator Cable

The accelerator cable passes through the frame tunnel and fan housing of the engine in guide tubes. It is attached to the accelerator pedal rod at one end and to a swivel pin in the throttle valve lever at the other. Between tunnel and front engine cover plate, the cable passes through a plastic hose.

The spring pushed over the guide tube at the fan housing returns the accelerator cable and closes the throttle A sleeve prevents the spring from becoming deflected.





Removal

The removal and installation is facilitated by lifting the rear end of the vehicle.

1 - Disconnect accelerator cable from throttle valve lever.

2 - Compress the spring and remove spring seat. Take off sleeve and spring.

3 - Detach bolt from accelerator pedal and disconnect cable from bolt.

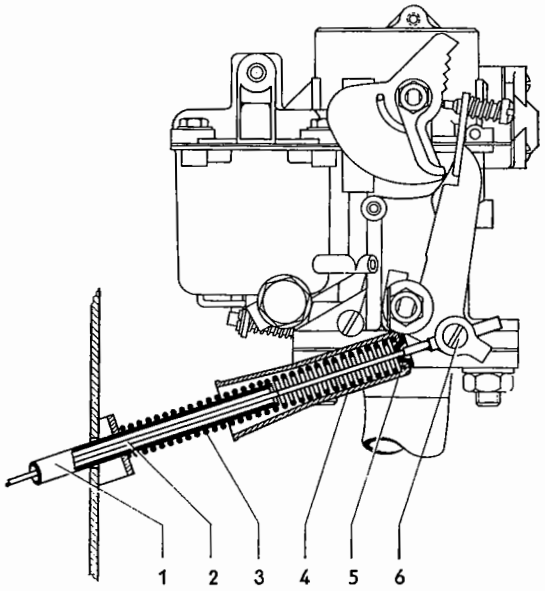
4 - Pull out accelerator cable from its guide tube in the fan housing towards the front.

5 - Pull plastic hose off cable.

6 - Take off rubber boot at the end of the cable guide tubes in the frame.

7 - Pull the accelerator cable towards the front out of the guide tube.

1 - Rubber boot
2 - Accelerator cable with plastic hose
3 - Clutch cable



1 - Accelerator cable guide tube
2 - Accelerator cable
3 - Accelerator cable spring
4 - Spring sleeve
5 - Spring seat
6 - Accelerator cable pin

Installation

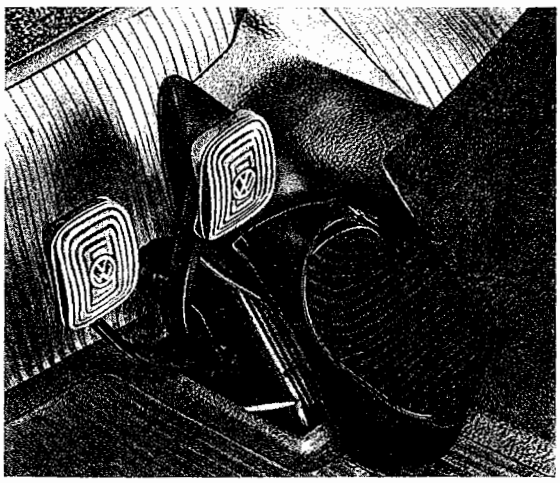
When installing, the following points should be noted:

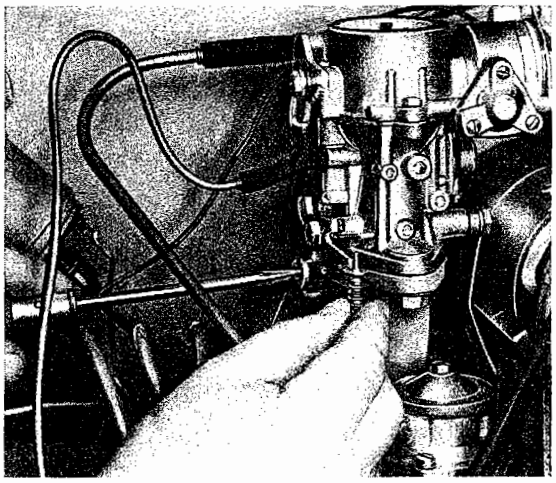
1 - Grease accelerator cable with universal grease.

2 - The accelerator cable must be laid straight between the guide tubes.

3 - Make sure that the rubber boot and the plastic hose are correctly seated to prevent water from entering the guide tubes.

4 - Special care must be taken when attaching the accelerator cable to the throttle valve lever as otherwise excessive tension may occur at full throttle and cause breakage of the cable. Open throttle valve





so that there is a clearance of about 1 mm (.04") between throttle lever and stop on carburetor body. Fully depress accelerator pedal and connect cable to throttle valve.

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Note:

From August 1965, Chassis No. 116 000 002 (Engine No. F 0 000 001), all 1.3 liter engines are fitted with a modified SOLEX carburetor 30 PICT-1. Externally, this carburetor is the same as the 28 PICT-1 but the venturi, jets and the diameter of the mounting flange are different.

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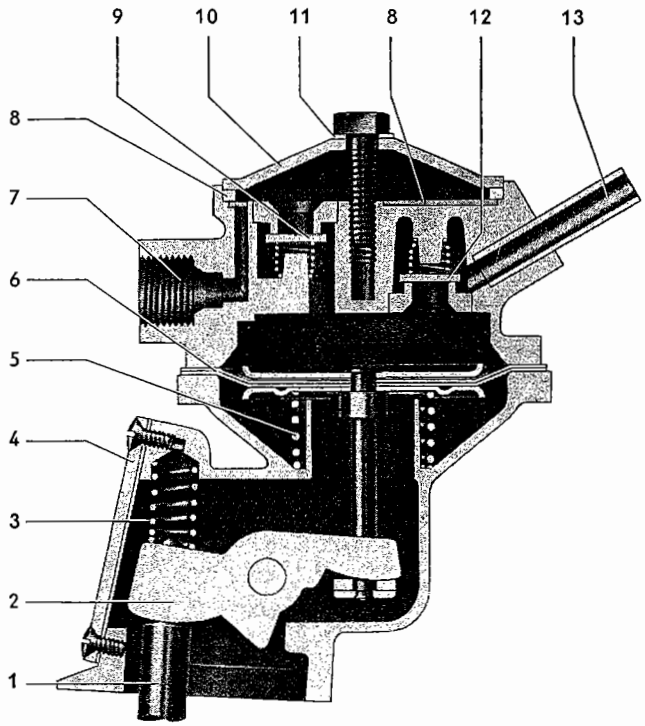
Operation

Fuel is fed to the carburetor by a diaphragm pump which is attached to the crankcase. It is operated mechanically from an eccentric on the distributor drive shaft. The flow of fuel delivered by the pump is automatically regulated as the fuel is used up from the float bowl.

The fuel pump consists of the top half, containing suction valve and delivery valve, and the bottom half, incorporating the rocker mechanism. The diaphragm and spring are situated between the cover and the body. The diaphragm consists of several layers of special flexible, clothlike material that is not affected by the fuel and two support washers which are riveted to the diaphragm pull rod.

General Description

As the distributor drive shaft revolves, the eccentric causes the push rod to move against the rocker arm which pulls the diaphragm downward against the diaphragm spring. This movement creates a vacuum above the diaphragm which lifts the suction valve off its seat so that fuel can be drawn in. When the push rod moves downwards, the loaded diaphragm spring pushes the diaphragm upward, forcing the fuel in the pump through the delivery valve into the carburetor. This process is repeated at every turn of the eccentric (once every two revolutions of the engine).



1 - Push rod
2 - Rocker arm
3 - Rocker arm spring
4 - Inspection cover
5 - Diaphragm spring
6 - Diaphragm
7 - Fuel intake
8 - Filter
9 - Suction valve
10 - Fuel pump cover
11 - Gasket
12 - Delivery valve
13 - Fuel outlet

The pump pressure depends on how much the spring is compressed during the pump suction stroke. This pressure is balanced by the buoyancy of the carburetor float, which causes a corresponding pressure at the needle valve seat. As fuel rises in the float bowl, the needle is forced up with greater pressure. Thus the pressure in the fuel line and pump chamber increases, while the pump working stroke decreases. With normal engine operation, the diaphragm is moved only a fraction of a millimeter.

A hole is provided to ventilate the chamber below the diaphragm. This hole also permits the draining of fuel which may have entered the lower chamber.

The fuel pump requires no regular lubrication, as it is lubricated from the crankcase. The filter should be cleaned at the intervals given in the Maintenance Chart.

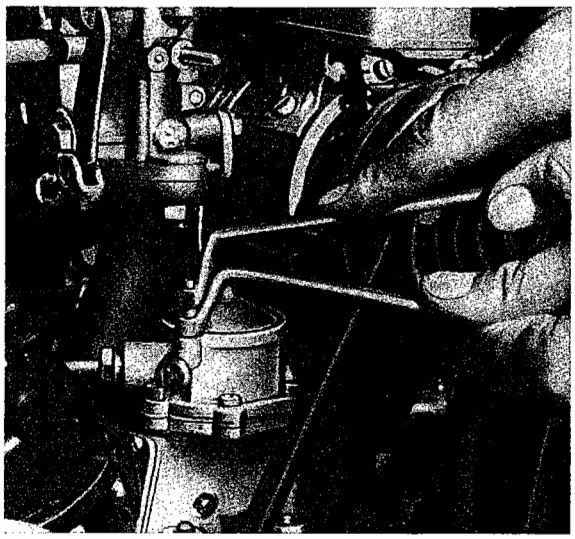
Note:

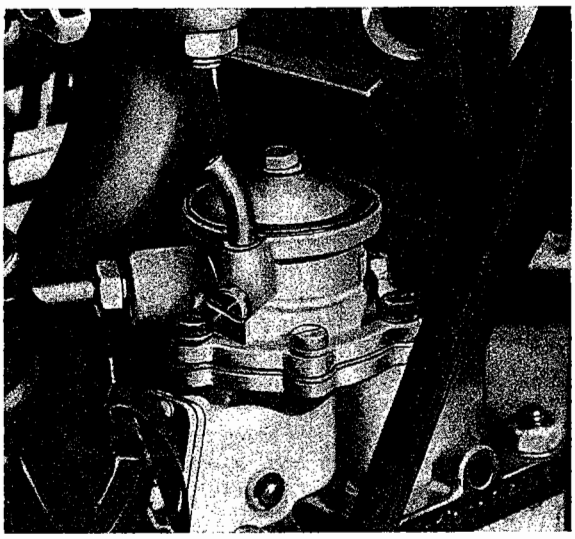
From Chassis No. 3 275 700 all engines were equipped with a fuel pump (Part No. 113 127 025) which has a bent delivery pipe in place of the former straight vertical type.

Before this modification was introduced, the throttle lever on the 28 PICT carburetor sometimes came into contact with the pipe between the fuel pump and carburetor when the throttle was opened fully. This should be rectified on all vehicles at the next opportunity by making the following alteration:

Bend the vertical pipe towards the ignition coil with two cranked 6 mm ring wrenches as shown overleaf.

The pipe must be held firmly with the lower wrench and bent with the upper wrench. Care should be taken to avoid loosening the pipe and causing it to leak or breaking the die-cast pump housing at this point.





Note:

From Chassis No. 3 606 032 the delivery pipe on the fuel pump (unchanged Part No. 113 127 025) is angled upwards.

At the same time, the filter (Part No. **new** 113 127 177 A) was modified and an additional gasket (Part No. 113 127 183) installed between filter and pump cover.

The new filter and gasket can be installed in previous pumps but the old filter will not fit the new pump upper part.

Note:

From Chassis No. 3 373 469 all engines are equipped with a black rubber hose with a woven outer covering (Part No. **new** 111 209 185 A) between the fuel pump and carburetor in place of the light-colored synthetic hose.

When stocks of Part Nos. 113 127 511 and 111 127 511 B have been used up, the new type (Part No. 111 209 185 A) should be installed.

Note:

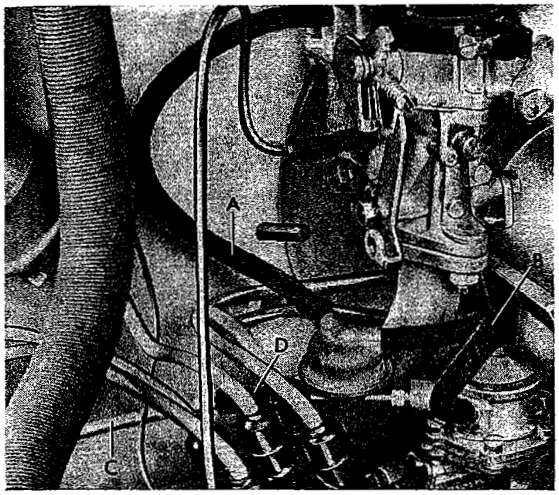
From Chassis No. 4 636 869, the black fuel hose (Part No. 111 209 185 A) between fuel pump and carburetor was replaced by a pipe with hose connecting pieces at each end. Only the previous type of hose (Part No. 111 209 185 A) will be supplied as a spare part.

On installation, ensure that the pipe part of the new line does not contact the vacuum line.

Note:

From September 1964, Chassis No. 115 083 659 (Engine No. 8 888 105) the fuel line on the 34 bhp (41.5 SAE bhp) engine is fitted with a valve (Part No. 113 127 405) which stops the flow of fuel to the carburetor when the engine is not running. When the engine is started, the valve is opened by the pressure from the pump.

The fuel lines have been altered slightly to fit the valve. The line between the front engine cover plate and the fuel pump is secured by a clip which is fixed to the screw attaching the fan housing to the cylinder cover plate.



The following parts, which are also required for service installation, have been changed:

	Part No.
Valve for fuel line	113 127 405
Bracket for fuel hose	311 127 525
Nipple	111 127 531 A
Fuel hose (410 mm long)	N 20 355 1

When required, the valve can be service installed as follows:

1 - Seal the fuel line and remove fuel lines and hoses in engine compartment.

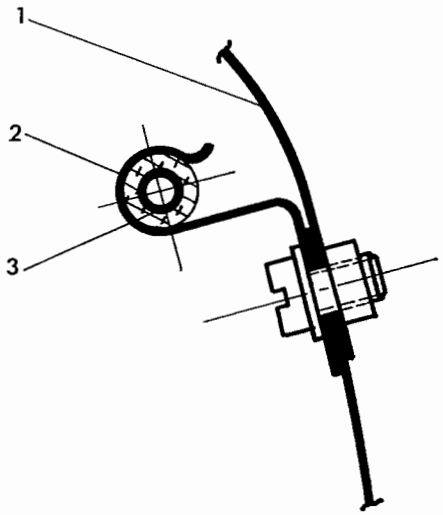
2 - Place union nut and new nipple on the pipe in the valve. Connect pipe to fuel pump, align valve properly and fully tighten union nut.

3 - Install a new hose, 250 mm long (A), between valve and carburetor.

4 - Install a new hose, 160 mm long, between pump and valve (B).

5 - Shorten the existing fuel line (C) 90 mm on the nipple side and install it. Cut a 45 mm long piece (D) off an existing hose and install it between line and valve. Install the hose coming from the frame on the fuel line.

6 - Cut a 20 mm long piece of existing hose open lengthwise and fit it on the line to the pump. Install clip (311 127 525) on this piece of hose and secure clip with the screw attaching fan housing to left cylinder cover.



1 - Fan housing
2 - Clip for hose
3 - Fuel line

7 - Start engine and check all lines and hoses for leakage.

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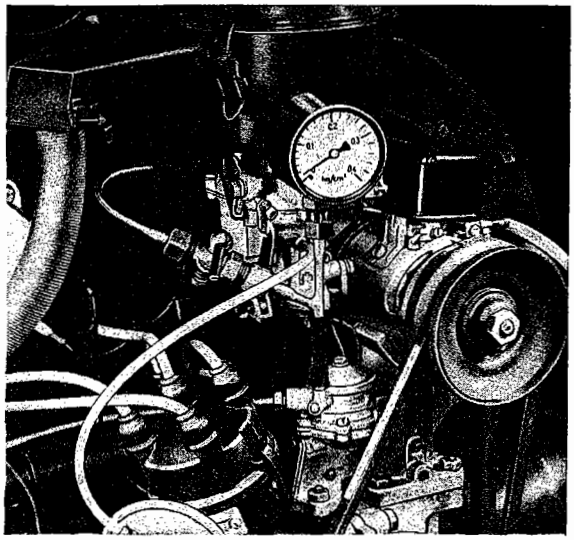
Checking Pump Pressure

The maximum pump pressure should be 0.2 kg/sq. cm (2.8 lbs./sq. in.) with the needle valve closed and the engine running at 3000 rpm. The minimum amount of fuel delivered is 267 c.c. per minute (16.3 cu. ins.). To check the fuel pump pressure, connect a gauge (range: 0—0.4 kg/sq. cm = 0—5.7 lbs./sq. in.) which is brazed to a fuel test line between the pump and the carburetor by means of a T-piece. The fuel test line is fitted with a fuel tap behind the gauge (drawing VW 663/1 for local manufacture).



The pump pressure is determined by the correct adjustment of the push rod stroke and the diaphragm spring tension.

Adjustment of the push rod stroke is afected by adding or removing flange gaskets as described under the heading "Removing and Installing Fuel Pump".

If the stroke adjustment does not give the desired result, replace the diaphragm spring. If the pump pressure is too high, the intermediate turns of the spring may be brought further together, and if the pump pressure is too low they may be stretched apart as an emergency measure.

If the pressure is too high, flooding, and dilution of the engine oil will be the result.

If it is too low, insufficient fuel will be delivered and faulty engine performance will result.

Removing and Installing Fuel Pump

Removal

1 - Disconnect fuel hose from pump.

2 - Remove the two nuts from the mounting studs at the flange (Wrench VW 126a or 126b).

3 - Take off pump.

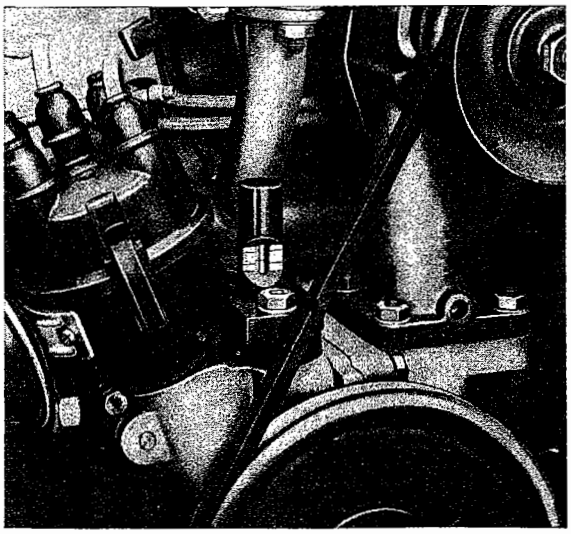
4 - Remove push rod, intermediate flange and gasket.

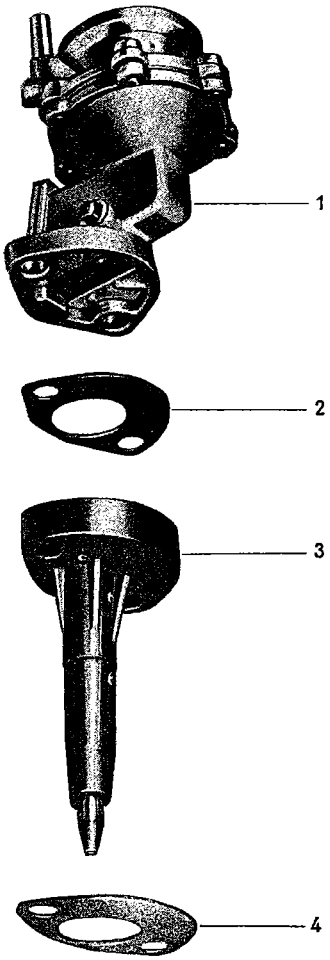
Adjusting Fuel Pump Stroke

1 - Place intermediate flange, push rod and two gaskets, which should be in perfect condition, on fuel mounting studs. The convex end of the push rod must be at the eccentric of the distributor drive pinion.

2 - Attach Gauge VW 328c to the flange and tighten it to the same torque as for the fuel pump in order to compress the gaskets to their usual thickness.

The push rod stroke of about 4 mm (.16") is determined by the eccentric on the distributor drive shaft. The stroke should move within a range of 5 mm (.2") which is marked on the gauge. The marks correspond to a length of 8 mm (.31") and 13 mm (.51") measured from the tuel pump contact flange (incl. gaskets) to the projecting push rod end. Rotate the engine to check the pump stroke. The stroke can be adjusted by fitting an appropriate number of gaskets to the intermediate flange. Do not fit less gaskets than required, as this would have a detrimental effect on the diaphragm and the drive mechanism.





Installation

Caution

Do not insert the push rod until the intermediate flange has been installed as otherwise there is a danger that it may slip through the flange into the crankcase.

1 - Fill lower pump chamber with Universal Grease before installation.

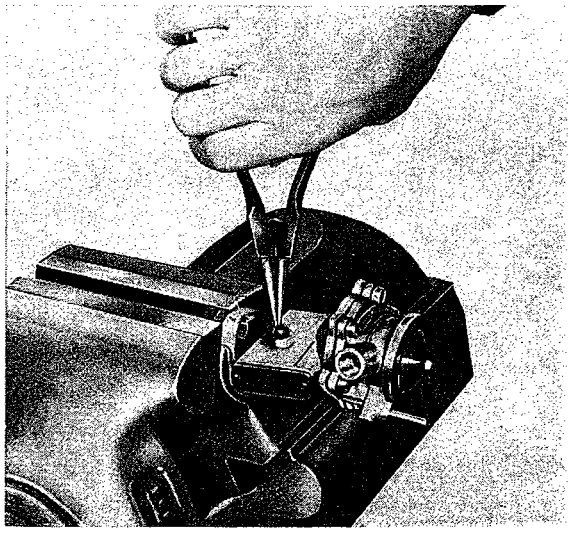
2 - Install fuel pump so that the inspection cover is facing towards the left. Retighten nuts when the engine has attained working temperature but do not overtighten.

3 - Connect fuel line and hose.

Check that the fuel line rubber grommet is correctly seated in the engine front cover plate.

1 - Fuel pump
2 - Gasket
3 - Intermediate flange
4 - Gasket

Reconditioning Fuel Pump

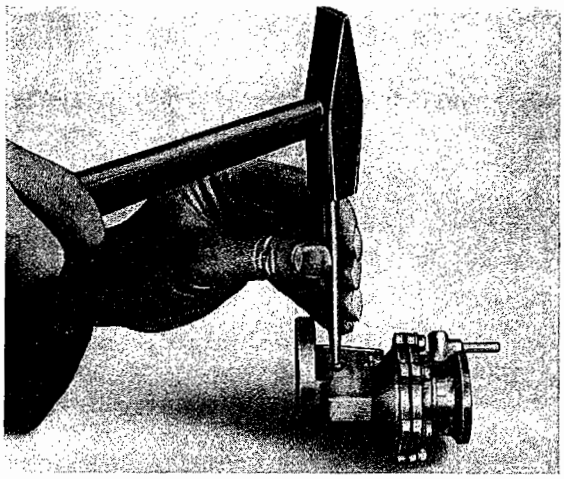


Disassembly

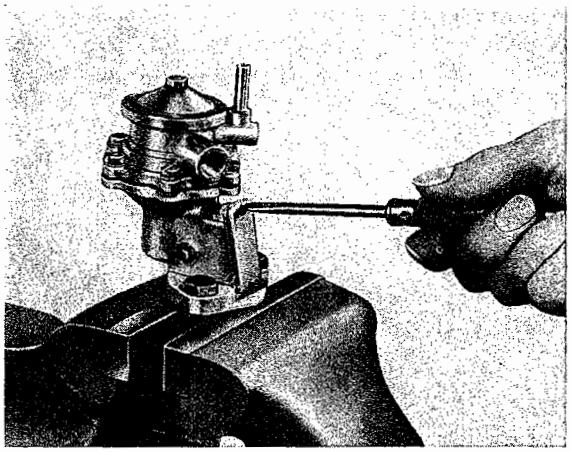
1 - Remove fuel pump.

2 - Remove lock ring on rocker arm pin.

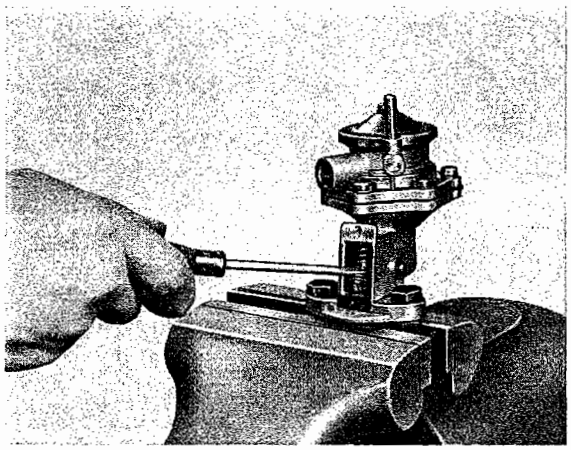
3 - Drive out rocker arm pin.



4 - Unscrew the two slotted screws on the inspection cover and remove cover.

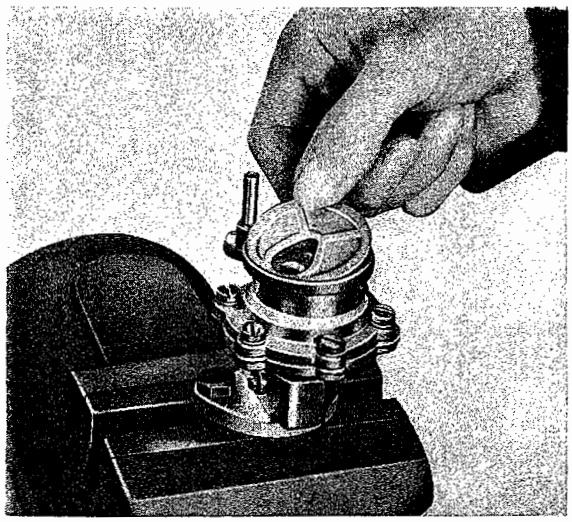


5 - Remove rocker arm return spring with a screwdriver.



6 - Remove cover screw with an 8 mm open-end wrench.

7 - Withdraw filter carefully from top half.



8 - Unscrew the six slotted screws and take off the top half of pump.

9 - Press down diaphragm and remove rocker arm.

10 - Take diaphragm with spring and gasket out of bottom half of pump.

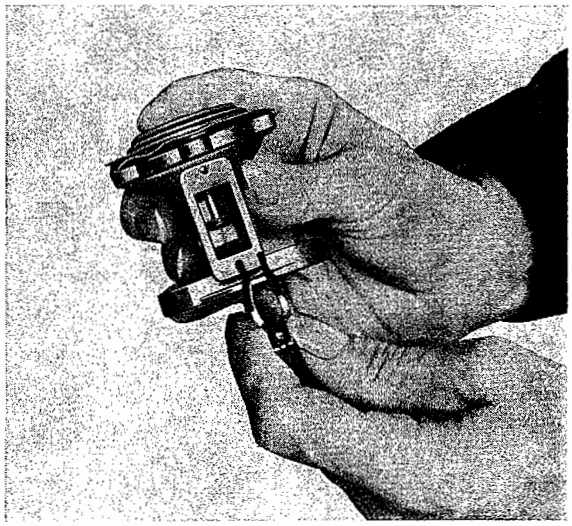
When installing, the following points should be observed:

1 - Check valves carefully; replace top half if necessary.

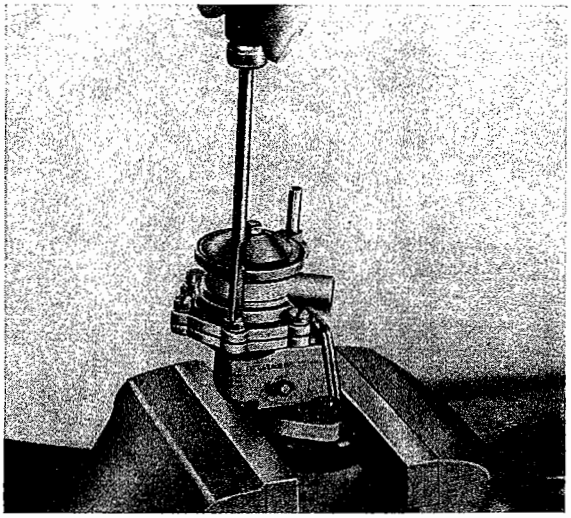
2 - Replace diaphragm and rubber gasket if they shows signs of hardening.

3 - Press down diaphragm and spring and insert rocker arm in diaphragm.

Insert pin and secure by means of lock ring.



4 - Place lower half of fuel pump in a vice with the Gauge VW 328d inserted. Thus the rocker arm is pressed in 14 mm (from flange jointing face), bringing the diaphragm to the required assembling position.



5 - Place the top half of pump in position so that the fuel connections are situated above the inspection cover. Make sure that the diaphragm is not creased. Insert filter so that the flat side is positioned downwards. Do not omit the sealing washer between pump cover and mounting screw.

6 - Fill lower half of pump with Universal Grease (cold-resistant). The grease assumes a liquid condition at operating temperature and lubricates all moving parts. Rocker arm and push rods which are devoid of grease or oil indicate a leaky diaphragm.

7 - Check rocker arm spring for proper seating.

8 - Check inspection cover gasket for wear, replace if necessary.

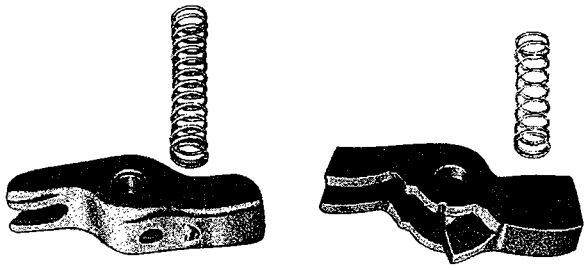
Note:

When replacing parts, use only the genuine spare parts.

Note:

From Chassis No. 4 432 262, the pump operating lever (Part No. **new:** 113 127 117 A) was modified and is now a one-piece pressing. The lever return spring (Part No. **new:** 113127131 A) has been lengthened at the same time.

The new operating lever may only be installed in previous type pumps together with the new spring. Old type levers and springs can be installed in the modified pumps.



new old

Note:

The diaphragm springs for the fuel pumps of Type 1 and 2 vehicles differ in color and wire thickness from the spring for the Type 3.

If the springs are interchanged, the pump pressure would be either too low or too high. To avoid confusion in the future, the following distinguishing features are used:

	Wire thickness	Color	Part No.
Type 1 and 2	1.5 mm dia.	silver	113 127 147
Type 3	1.6 mm dia.	brass	311 127 147

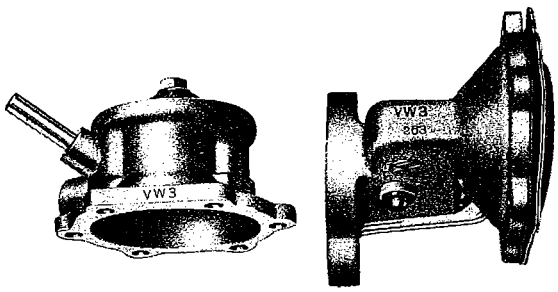
Note:

From June 1963, Chassis No. 5 578 122, Engine No. 7 777 338 (except 30 bhp engine) a fuel pump with a modified upper part was fitted. This pump has a leaf spring flap valve on the suction side and a plastic disc valve on the pressure valve. The pump is fitted on the 34 bhp engine and is marked VW 3.

Pump	Part No. 211 127 025
Upper part	Part No. 211 127 171
Diaphragm spring (wire thickness 1.5 mm)	Part No. 113 127 147

Delivery output: 5.25 gall/hour = 400 cc/min.
Maximum pressure 2.8 psi

The picture shows where the identification marks are on the pump upper and lower parts



Note:

From August 1963, Chassis No. 5 700 147, Engine No. 7 860 830 (except 30 bhp engine) the intermediate flange for the fuel pump is made of a different material (Part No. 113 127 303 as before). The new flange can be distinguished from the former dark-brown version by its red-brown color.

Only the new flange will be supplied as a spare part. The old type parts must not be used.

Important

When installing the new flange, take care that the tightening torque for the securing nuts does not exceed 1.5 mkg (11 ft. lbs.).

Fuel Pump Trouble Shooting

Symptoms	Cause	Remedy
1 - Pump leaking at joining faces: Loss of fuel	a - Slotted screws loose b - Diaphragm cracked	a - Tighten screws b - Renew diaphragm (VW 328d)
2 - Diaphragm leaks at rivets: Loss of fuel	Diaphragm damaged by incorrect assembly	Renew diaphragm (VW 328d)
3 - Diaphragm material leaky: Loss of fuel	Diaphragm material damaged by solvent substance in fuel	Renew diaphragm (VW 328d)
4 - Excessive pump stroke: Overstraining the diaphragm	Pump incorrect installed, gasket too thin	Install pump correctly (VW 328c), check diaphragm, if necessary
5 - Pump pressure low	a - Pump incorrectly installed, gasket too thick b - Spring pressure low	a - Install pump correctly (VW 328c) b - Renew spring or, if necessary stretch coils apart
6 - Pump pressure excessive: Float needle valve forced down	a - Pump incorrectly installed, gasket too thin b - Spring pressure excessive	a - Install pump correctly (VW 328c) b - Renew spring or, if necessary, bring intermediate turns closer together
7 - Fuel pump inoperative or insufficient fuel delivery	Valves leaking or sticking	Renew top half of pump

General

The fuel tank has a capacity of 40 liters (10.5 U.S. gals.; 8.8 Imp. gals.). Access is obtained by lifting the rearhinged front hood.

Removing and Installing Fuel Tank

Removal

1 - Lift out spare wheel, jack, and tools

2 - Remove luggage compartment lining.

3 - Shut the fuel tap.

4 - Remove cotter pin at the end of the fuel tap operating rod, after taking the right hand front wheel off, and withdraw operating rod.

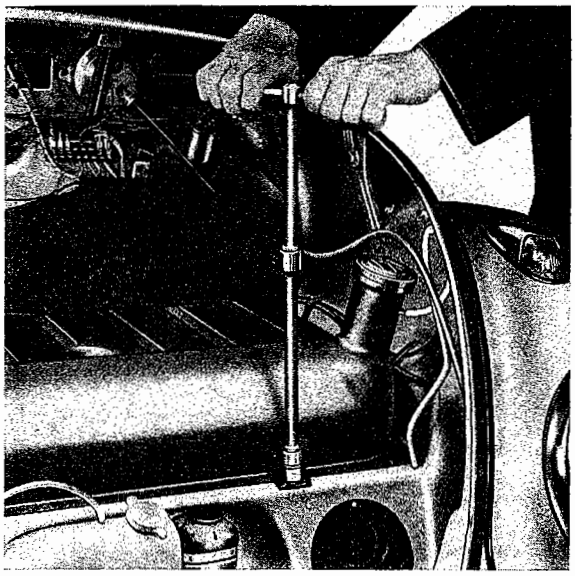
5 - Pull the fuel hose off the fuel tap.

6 - Remove fuel tank breather pipe.

7 - Remove the four tank retaining screws and lift off the tank.

8 - Remove fuel tap.

9 - Flush the tank with fuel and blow it out with compressed air.



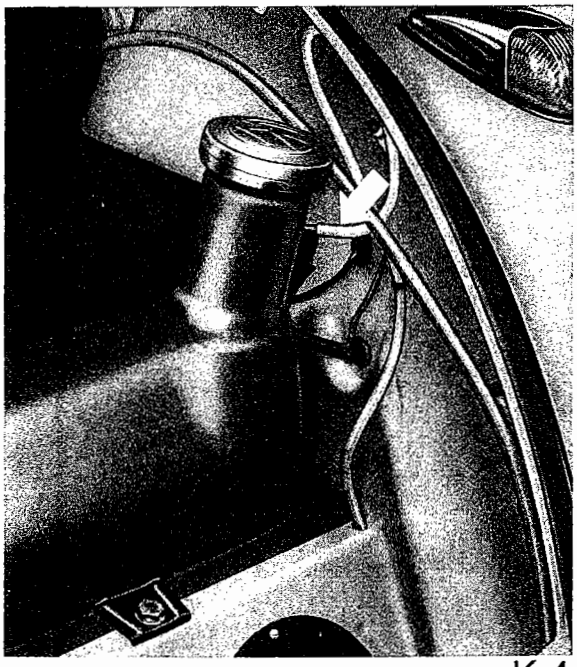
Installation

When installing, the following points should be observed:

1 - Place fuel tank anti-squeak packing in position; renew packing if damaged.

2 - The fuel tap operating rod must neither be tight nor rattle in its hole in the body. Note. correct seating of grommet. Tight fittings rods should be installed with the use of French chalk or brake fluid. (Caution: Brake fluid will affect paint.)

3 - Replace breather pipe.



Note:

The fuel tank filler cap serves the dual purpose of providing a seal and compensating for any difference in the pressures of the atmosphere and the tank.

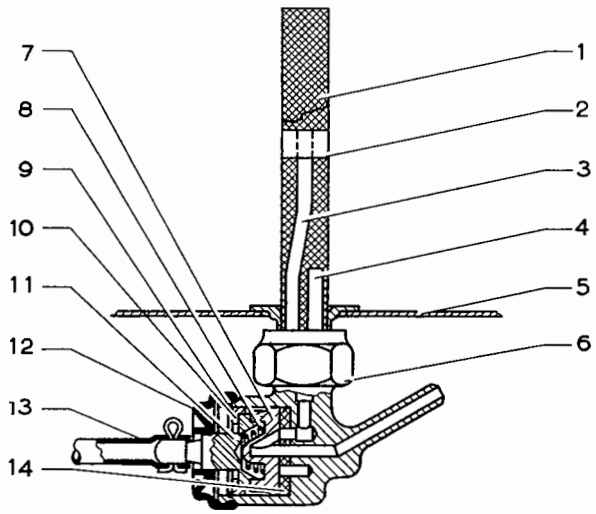
If fuel leaks out at the filler cap, proceed as follows to eliminate the source of the trouble:

1 - Remove the cap and make sure that the cork gasket is at least 2.3 mm (.09″) thick and sufficiently supple. Renew hard or damaged gaskets. If no new gasket is available, place old gasket in warm water for a few minutes and reinstall it.

2 - Check filler neck edge for evenness (e.g. with a glass plate and a feeler gauge). Premissible unevenness: 0.1 mm (.004″). Greater deviations and damage, which might have been caused in refueling, are not compensated for by the cap gasket. In such cases, smooth off the filler neck edge with a finishing file. Make sure that no metal chips drop into the tank. If necessary, flush out the tank.

3 - If the above measures do not eliminate the trouble, replace the filler cap, as the sealing in the cap is then likely to be defective.

Fuel Tap



Fuel passes through a filter in the tank via the fuel tap into the fuel line. The tap is operated from the front seat. Its three positions are: "open", "reserve" and "off".

1 - Filter
2 - Cork washer
3 - Fuel pipe with tap at "Open"
4 - Fuel pipe with tap at "Reserve"
5 - Fuel tank
6 - Nut
7 - Plate
8 - Spring
9 - Retaining ring
10 - Stop washer
11 - Tap spindle
12 - Rubber cap
13 - Operating rod
14 - Gasket

Removing and Installing Fuel Tap

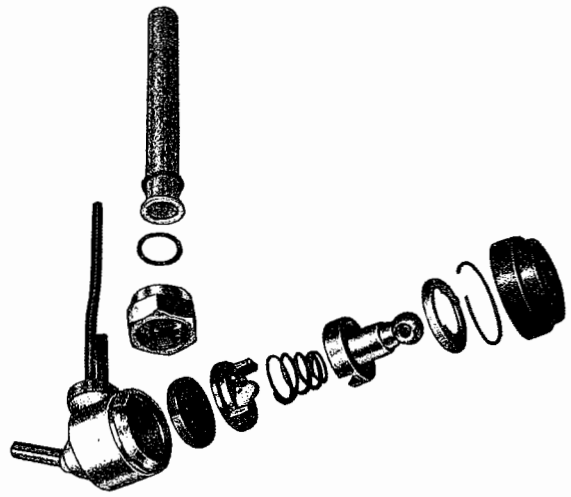
To clean the filter and the tank, the tap must be removed.

Removal

1 - Remove and drain fuel tank.

2 - Loosen fuel tap nut and take off the tap.

3 - Clean filter with compressed air.



Installation

When installing, the following points should be observed:

1 - Carefully clean fuel tank.

2 - Use new fuel tap gaskets.

Note!

The cork disk between the filter and the long drain pipe should be nearly flush with the upper edge of the pipe.

3 - After installation, check connections for leaks.

Reconditioning Fuel Tap

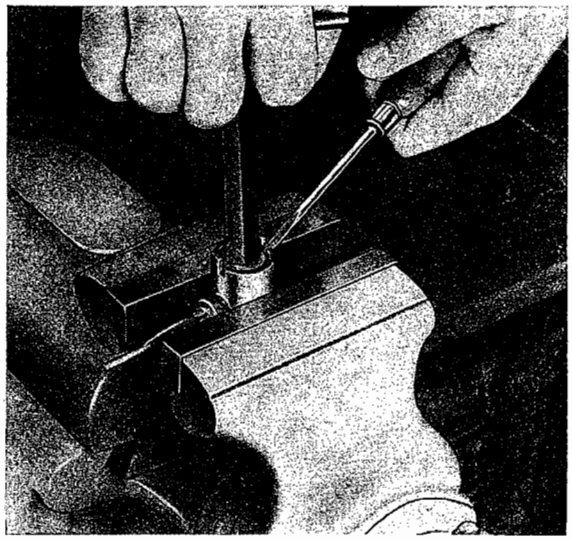
Disassembly

Remove the fuel tap and proceed as follows:

1 - Remove protective cap.

2 - Press down stop washer with a piece of tube and remove retaining rind and washer.

3 - Remove spindle, spring, plate and thiokol gasket.



Assembly

When installing, the following points should be observed:

1 - Thoroughly clean all components and dry them with compressed air.

2 - Use a new thiokol gasket for the spindle plate.

Note:

From Chassis No. 3 191 531 the fuel taps on all vehicles are equipped with a Thiokol gasket (unchanged Part No. 111 209 113 A). The increased hardness of this gasket material prevents fuel stoppages due to restricted delivery openings.

Derusting of Fuel Tanks

A fuel tank which shows formation of rust on the bottom due to the content of water in the fuel is liable to lead to constant contamination of the fuel system and resultant engine failure. Such tanks can be cleaned by applying acid type chemicals as detailed below.

There are two methods which may be used, but preference should be given to method "A". It is not so severe, has a good pickling effect and leaves a phosphate film.

In both cases, however, the success of the acid treatment is dependent on the fact that the fuel tank must be rinsed out immediately with soluble oil. If not rinsed, rust will form again.

A - **Derusting Phosphate Agent "Antox Extra M"**

The solution should be mixed as follows:
1 part of Antox Extra M to 10 parts of water.

B - **Hydrochloric acid solution (for industrial use) Specific weight 1.19**

It should be mixed as follows:
20 parts of hydrochloric acid solution to 80 parts of water and 1 part of restrainer.

When rinsing use a mixture of 1 part of coolant (usual mineral oil type) to 20 parts of water.

The fuel tank should be treated in the following manner:

1 - Place the tank horizontally in a suitable rack and replace the tap by a snugly fitting wooden plug.

2 - Pour either of the two solutions, A or B, into the tank. The tank should be filled up to the filler, as otherwise the evaporized acid will adversely affect the tank wall above the fluid level.

3 - A slight accumulation of rust calls for a treatment of 40 or 60 minutes while the time required in more severe cases may vary from 3 to 8 hours. The filled can tank be left standing

overnight to obtain best results without loss of time to the owner.

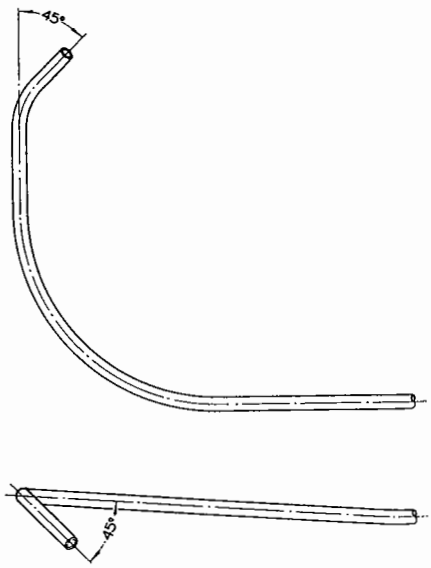
4 - After the treatment the tank should be washed out immediately with the rinsing solution. About 4—5 litres (0.9—1.1 Imp. gal.) should be used and the tank rocked to and fro so that the complete interior is moistened.

5 - Drain the tank and dry it out with compressed air. Treatment with soluble oil leaves a thin film and consequently further treatment is not necessary.

An adequate amount of acid type cleaner — 45—50 litres (9.9—11.0 Imp. gal.) — should be stored in glass containers ready for use when needed. The same cleaner can be used from 10—15 times.

Available are:

Designation	Manufacturer	Address
Antox Extra M	Metallgesellschaft Frankfurt/Main	Frankfurt, Reuterweg 14
Hydrochloric aced solution (Industrial use)	Usual type	Chemical Dealers, Chemists
Coolant, mineral oil type	Usual type	Mineral oil firms
Original Dr. Vogel's Sparbeize	Messrs. Max Hoeck Chemical Factory	Duesseldorf-Oberkassel Kaiser-Wilhelm-Ring 45/46, Postfach 6 Germany
ACP-Rodine 50 Sparbeize	American Chemical Paint Co.	Ambler, Pa. U.S.A.
Henkel's Sparbeize	Messrs. Henkel & Cie.	Duesseldorf, Germany



Note:

From Chassis No. 3 631 277 the front end of the fuel line was bent 45° backwards and to the left above where it enters the frame tunnel.

This modification improves the routing of the hose from the fuel tap to the line so that it does not become kinked.

The Part No. of the fuel line remains unchanged — 111 209 211 B.

Note:

If trouble is experienced with the fuel supply due to a kinked fuel hose, the fuel line should be bent carefully at the appropriate place.

Note:

From Chassis No. 4 010 995 all Volkswagens are equipped with a mechanical fuel gauge. The sender unit and the gauge are connected by means of a cable.

The fuel gauge in the instrument panel shows the amount of fuel in the tank. When the needle is on "R" —Reserve — there are about 5 liters (1.1 Imp. galls., 1.3 US galls.) left in the tank and it is time to refuel at the next opportunity.

The fuel tap has been discontinued but will remain available as a spare part.

Adjustment

The gauge can be adjusted by means of a knurled screw on the back of the instrument. It is advisable to do this when the tank is empty. The screw must be turned in the direction of arrow until the needle is resting on its stop. Further calibration to a certain fuel content is unnecessary.

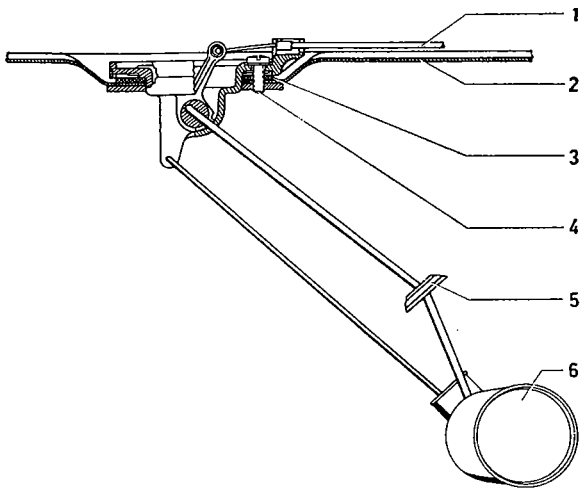
This process can also be used when there is still a certain amount of fuel in the tank. In this case the sender unit cover should be removed and the lever, to which the cable is attached, pressed to the rear until the float is at its lowest position.

This adjustment ensures sufficient accuracy in the lower range and guarantees that at least 5 liters of fuel is left in the tank when the needle is on the reserve mark. There may be slight inaccuracies in the upper range but they are not important.

Troubles

Complaints of inaccurate readings are occasionally received. This is particularly unpleasant when the inaccuracy is in the reserve range and the actual amount left in the tank is considerably less than 5 liters.

These variations are caused by defects at the sender unit and invariably occur when a "VDO" sender unit is paired with a gauge from Messrs. Magura. No trouble is experienced with the other combination or when items from the same manufacturer are used.



1 - Cable
2 - Fuel tank
3 - Cork gasket
4 - Screw
5 - Stop washer
6 - Float

As a provisional remedy we recommend that the VDO sender unit is replaced by the Magura type when the combination mentioned above is found. Only the Magura sender unit is supplied as a spare part. Efforts are being made in the meantime to modify the parts so that each combination works satisfactorily.

Note:

From June 1962, the plastic float of the VDO tank unit (Part No. 113 919 049) was altered in length **from 105 mm to 145 mm.** It is now possible to combine this float with a Magura fuel gauge.

The VDO fuel gauge (Part No. 113 919 029) has been fitted with a stronger spring. After the introduction of this modification in March 1962, Magura tank units can be paired with VDO fuel gauges without hesitation. Both makes of fuel gauge have the production date marked on the back of the housing. The figures 3 62 for example indicate that the gauge was manufactured in March 1962.

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Inspection of Fuel System

If the fuel supply to the carburetor is interrupted, check as outlined below.

Sequence of Operations

1 - Check quantity of fuel in tank.

2 - Check position of fuel tap.

3 - Disconnect fuel line at the carburetor. Operate the starter and check if fuel is delivered by the pump.

a - If fuel is delivered by the pump: Check pump pressure. Inspect float needle valve and carburetor jets for dirt and foreign matter.

b - If no fuel is delivered by the pump:

4 - Disconnect fuel line to fuel pump.

a - If fuel comes out: Check fuel pump for leaks. Re-tighten screws and connections; remove and check fuel pump, if necessary.

b - If no fuel comes out:

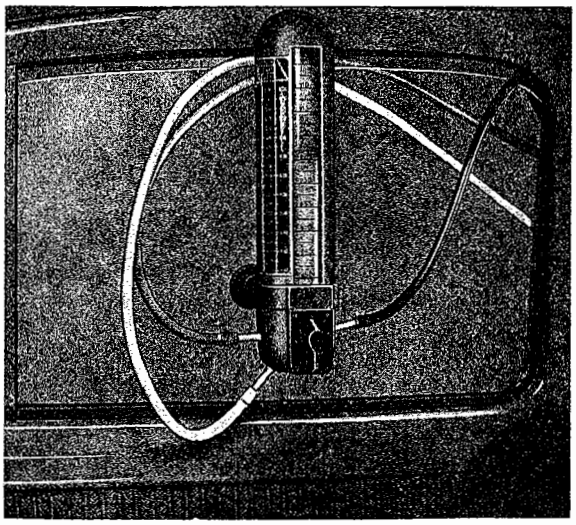
5 - Remove fuel tank; check fuel tap; clean filter; inspect gaskets.

6 - Blow fuel line out with compressed air.

Fuel Consumption Test

Average consumption test on the road

An accurate measurement of the fuel consumed can be made with a fuel-mileage tester which should be installed near the driver's seat. The fuel-mileage tester is connected to the engine by means of hoses. It should be possible to switch from normal to test equipment.



If the test result corresponds to the figures given by the factory, the driving habits or special operating conditions are responsible for high fuel consumption.

When carrying out the test, the following points should be noted:

1 - Adjustment of fuel pump, carburetor and ignition must be correct.

2 - The engine must have attained operating temperature before conducting the test.

3 - The car must be normally loaded.

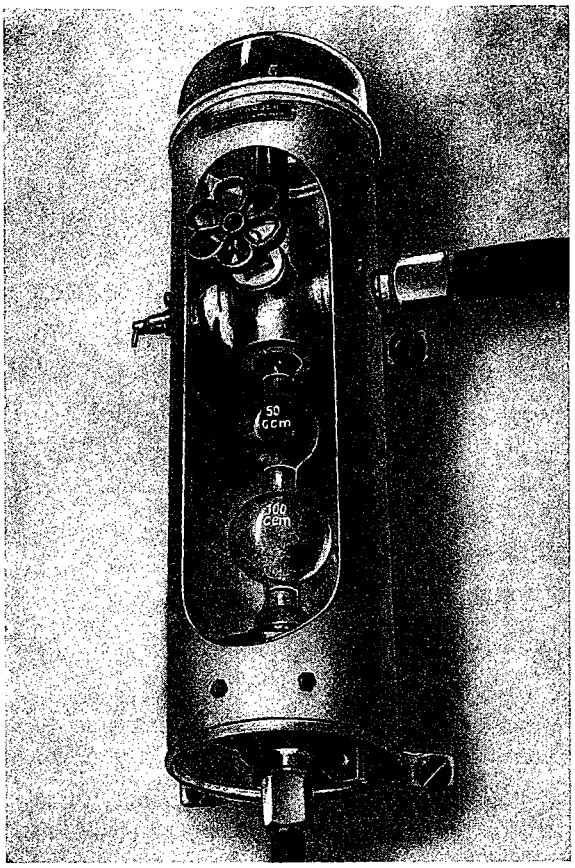
4 - Conduct the test on a level road and under average driving conditions. Periods of idling, stop and start operation, continuous driving in low gear in flat or hilly districts, rapid acceleration, and driving at top speed have a definite effect on the fuel consumption.

5 - Only normal branded fuel should be used. The consumption should be determined as follows:

Liter per 100 km (metric)

$$= \frac{\text{Fuel consumed (liter)}}{\text{Length of test course (km)}} \times 100$$

6 - The engine and the fuel system should be thoroughly checked if there is a considerable difference between the result of the fuel-mileage test carried out as outlined above and the nominal fuel consumption figures given by the factory.



Note:

A consumption test with a fuel level gauge and the mileage recorder generally gives only an approximate fuel consumption figure and is not, therefore, be recommended.

Fuel Consumption Test on Engine Test Bench (Dynamometer)

The fuel consumption can also be checked on the engine test bench by means of a gauged test container and a stop-watch. The consumption can be determined by subjecting the engine to a given load and speed during a fixed time.

The consumption figures for 100 cc. (6 cu. ins.) are given in the chart below.

Example:

At a speed of 2180 rpm and a brake load of 5 kg the consumption time for 100 cc. of fuel should be between 84.5 and 91.5 seconds.

The table only applies to engines which are completely broken in (run in) and equipped with the SOLEX 28 PICT carburetor.

The table contains only the normal measurements which correspond to road speeds of 50, 70 and 90 kms and full throttle. Further measurements are unnecessary as the consumption characteristics of the carburetor are uniform throughout the complete load range.

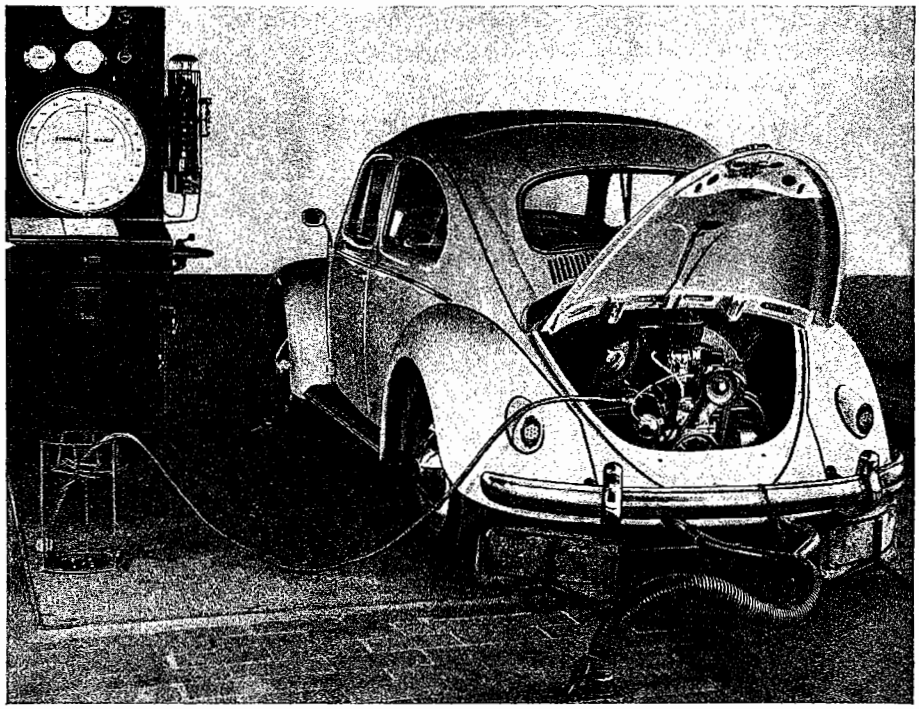
Brake load		Engine speed	Corresponding road speed		Consumption time for 100 cc. (6 cu. ins.) seconds
kg	lbs.	rpm	km	miles	
3.87	8.5	1550	50	31	144±6
5.0	11.0	2180	70	44	88±3.5
6.71	14.8	2800	90	57	56±2.2
9.1—9.9 (minimum)	20—22	3600	Full throttle		31.5±1.3

Note:

Generally the brake load at 3600 rpm should be at least 9.1 kg. If a higher loading is reached the consumption time can be shorter. If the given brake loading is not reached the consumption time may increase.

Fuel Consumption Test on Chassis Dynamometer

The fuel consumption can also be checked exactly with the car on a chassis dynamometer.



1 - Remove fuel line union nut from fuel pump and connect fuel hose of dynamometer to pump.

2 - Warm up the engine.

3 - Operate engine at full load until the dynamometer indicates a speed of 110 km/h (68 mph).

4 - Meter the consumption of 100 cc. of fuel by means of the measuring device on the dynamometer and a stop watch.

Note:

If complaints about excessive fuel consumption are received, the following points should be checked on the 28 PICT carburetor:

1 - The flap in the intake tube of the oil bath air cleaner must move freely. It should not be secured at temperatures below 20° C (68° F).

2 - The throttle valve spindle must move freely. If it is still tight after being moved back and forth several times, the lower part of the carburetor should be replaced.

3 - Check the ease of movement of the fast idle cam. If the cam is sticking, lubricate the bearings with a few drops of anti-corrosion oil.

4 - Check the location of the ceramic cover. The mark on the cover should be aligned with the lug in the housing.

5 - Check the operation of the automatic choke. First lift the throttle valve lever out of the steps on the fast idle cam so that the choke valve can move under the influence of the bi-metal spring. The automatic choke is working properly when:

a - the choke valve is completely closed in winter at temperatures of 0° C (32° F) and below or

b - is opened so far in summer at roughly 20° C that the idle adjusting screw rests on the third or fourth step from the top on the fast idle cam.

c - the choke valve is fully open when the engine is at operating temperature and the ignition switched on

6 - The heater element should warm up when the ignition is switched on. This can be checked at the outside of the ceramic cover.

When the engine and carburetor have cooled down to about 20° C, the choke valve should open fully in not more than 5 minutes from the time the ignition is switched on, with engine stationary and rear hood open. If this is not the case, the following defects may be found:

a - Faulty cable connection or loose terminal screw in ceramic cover.

b - Cable to ignition coil or heater element damaged.

c - Bi-metal spring sticking or rubbing in the housing.

d - Ceramic cover or locating tongue on the bi-metal spring broken.

7 - Check the idling adjustment and rectify if necessary.

Note:

The commercial fuels in many countries vary quite considerably in certain characteristics which are not exactly defined in the normal specifications. This also applies to the flash point of the fuel. If the flash point of a fuel is slightly low it can cause an engine to run-on when the ignition has been switched off, especially when assisted by the following conditions:

1 - Incorrect carburetor idling adjustment (too rich or too fast).

2 - Incorrect ignition timing (see instructions in Workshop and Instruction Manuals).

3 - Incorrect cooling air throttle ring adjustment (20 mm when assembling engine; 25—30 mm when engine warm).

To improve cooling, the rubber plug which acts as a stop for the throttle ring can be replaced by an 8—9 mm high plug (Part No. 111 119 189). See sechon M-4/6.

4 - Excessive carbon deposits in the combustion chambers in conjunction with working conditions, way of driving and type of fuel used.

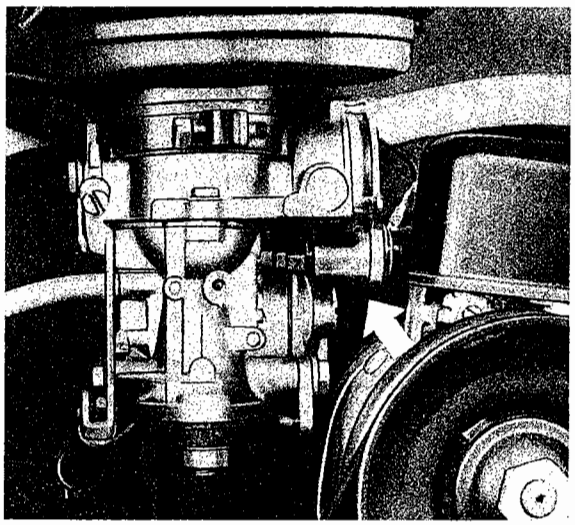
5 - Engine cooling affected by a loose fan belt or dirt deposits on engine exterior.

In exceptional cases where the pre-ignition cannot be satisfactorily cured by normal workshop means, a "Pilot jet with electro-magnetic shut-off valve" which is available for the 20 SAE hp engine under the Part No. 113 129 413, can be installed.

Installation:

a - Remove standard pilot jet and install the pilot jet with electro-magnetic shut-off valve.

b - Install a cable between shut-off valve terminal and terminal 15 on the ignition (length of cable about 400 mm/16″).



Operation

When the ignition is switched off, the electro-magnetically controlled needle closes the pilot jet and stops the flow of fuel. This effectively eliminates pre-ignition. When the ignition is switched on, the jet opening is cleared.

1 - VW Special Service Tools

VW 126a	Fuel Pump Wrench
VW 126b	Fuel Pump Wrench
VW 328c	Fuel Pump Push Rod Gauge
VW 328d	Fuel Pump Diaphragm Gauge

2 - VW Workshop Equipment for Local Manufacture

VW 663/1	Fuel Pump Tester

3 - Normal Hand Tools

Screwdriver,
Carburetor screwdriver
Combination pliers
Waterpump pliers
Mechanic's hammer, 300 grams
Triangular scraper
Open-end wrench, 8 mm
Open-end wrench, 11 mm
Open-end wrench, 13 mm
Open-end wrench, 12 mm
Open-end wrench, 14 mm
Open-end wrench, 17 mm
Open-end wrench, 22 mm
Box-wrench, 14 mm
Box-wrench, 17 mm
Bell cranked box wrench
Wire brush
Hand vice
Oil-can
Grease container
Caliper square, 200 mm in lenght, measuring in 1/10 mm
Tap M 6
Die stock, size 1
Die M 6
Tap wrench, size 1, adjustable

4 - Supplementary Workshop Equipment

Fuel mileage tester
Engine dynamometer
Chassis dynamometer

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Contents: V

Front Axle

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V-2 Front Axle Removal and Installation
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Steering

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Steering Troubleshooting
Adjustment of Lock Angle

Front Wheel Alignement

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Vehicle Measurement

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V-20 Workshop Equipment

Important — Do not re-use any fasteners that are worn or deformed in normal use. Many fasteners are designed to be used only once and become unreliable and may fail when used a second time. This includes, but is not limited to, nuts, bolts, washers, self-locking nuts or bolts, circlips, cotter pins. Always replace these fasteners with new parts.

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Description of Front Axle

General Description

The front axle consist of two rigidly joined tubes secured to the frame head by means of four bolts. Pivoted in each tube is a torsion bar, anchored at the middle to prevent twisting and lateral movement. The ends of the torsion bars are joined to the torsion arms, each of which is free to pivot in one fibre bushing and needle bearing in the tube. The outer ends of torsion arm are connected to the torsion arm links by adjustable pins, which are free to pivot. The stub axle (steering knuckle) swivels on a king pin, which passes through bushes in the torsion arm link. A thrust bearing is fitted between the upper end of the stub axle and the torsion arm link. Front axle tubes, torsion arms and torsion arm link nearly form a parallelogram. Hydraulic, double-acting telescopic shock absorbers dampen road shocks and take up the return swing. Stops with rubber buffers prevent excessively violent springing action.

The De Luxe Sedan, VW Convertible and Karmann Ghia models are equipped with a stabiliser and steering damper.

Note:

From Chassis No. 3 912 101 (Front Axle No. 3 872 754) the torsion arm stop is stamped with an identification letter and figure which is the production number of the axle. The front axle number itself is marked in white paint on the right-hand end plate. The front axle number is no longer stamped into the torsion arm stop.

Lubrication

Under normal driving conditions, the front axle should be greased at regular intervals as prescribed in the Lubrication Chart. If, however, the car is mainly used on rough roads or if it is driven not more than 12,000 km (7500 miles) in a year, that is a monthly average of below 1000 km (600 miles), it is advisable to grease more frequently than specified in the chart, say every 1250 km (800 miles), particularly at the lubricating points of the torsion arm links and the outer tie (track) rod joints. The front wheel bearings should be thoroughly cleaned and repacked with grease every 50,000 km (30,000 miles) or at least once a year.

Important — Perfect lubrication of the front axle bearing points is only ensured with the front axle raised (unloaded condition). Grease should be injected into the fittings until the excess grease begins to emerge at the edges of the lubrication points. The service life of the front axle depends on skilled lubrication with branded lubricants which conform with the specifications given by the Volkswagenwerk. When lubricating, the grease fittings and grease guns should be perfectly clean.

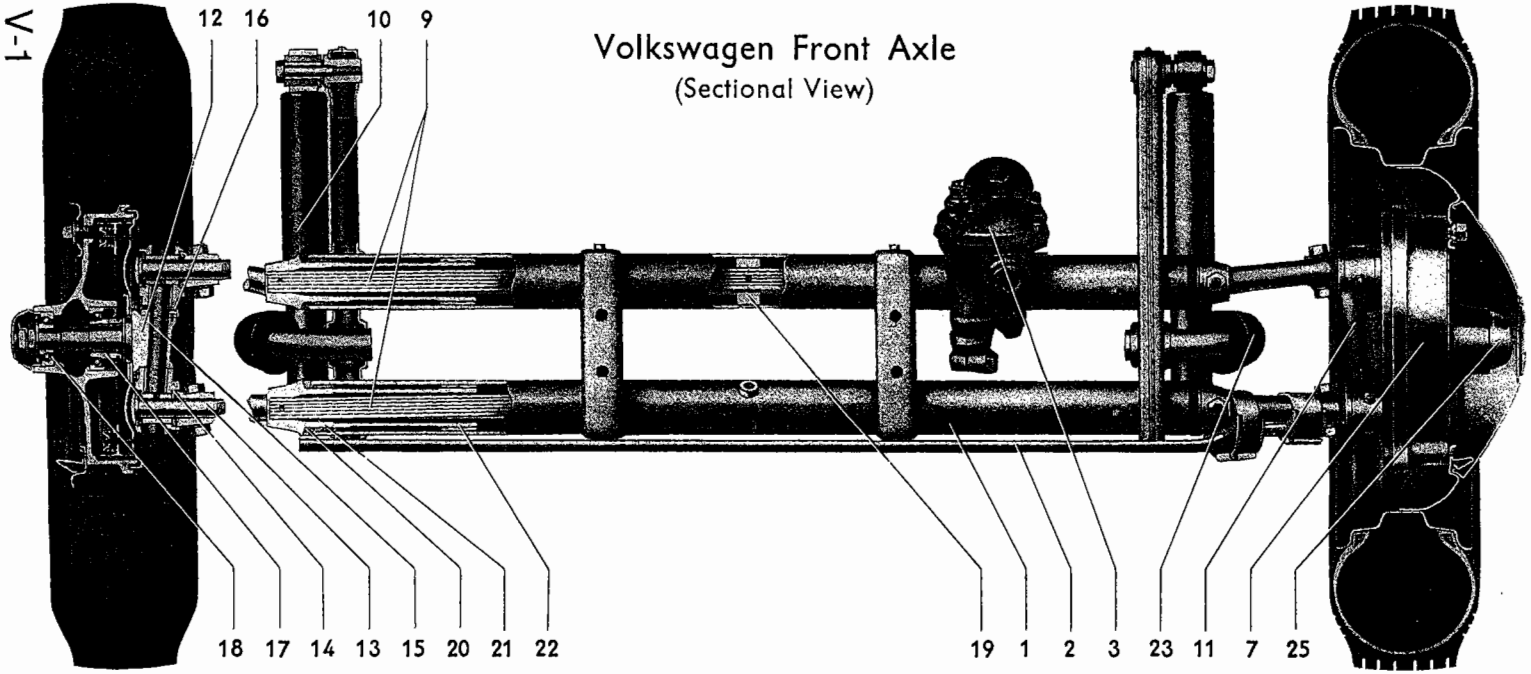
Maintenance

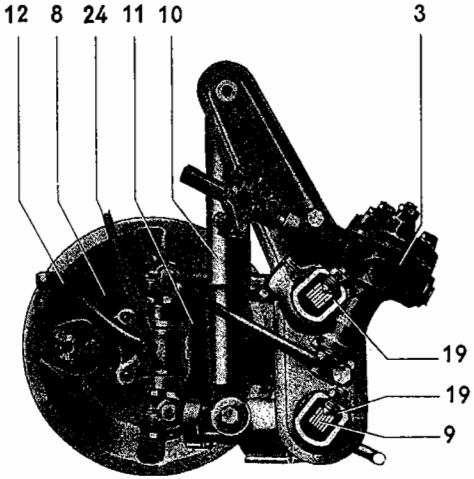
To maintain the riding qualities and the standard of safety of the car, regular inspection and maintenance of the front axle and steering is absolutely necessary. The following operations are prescribed:

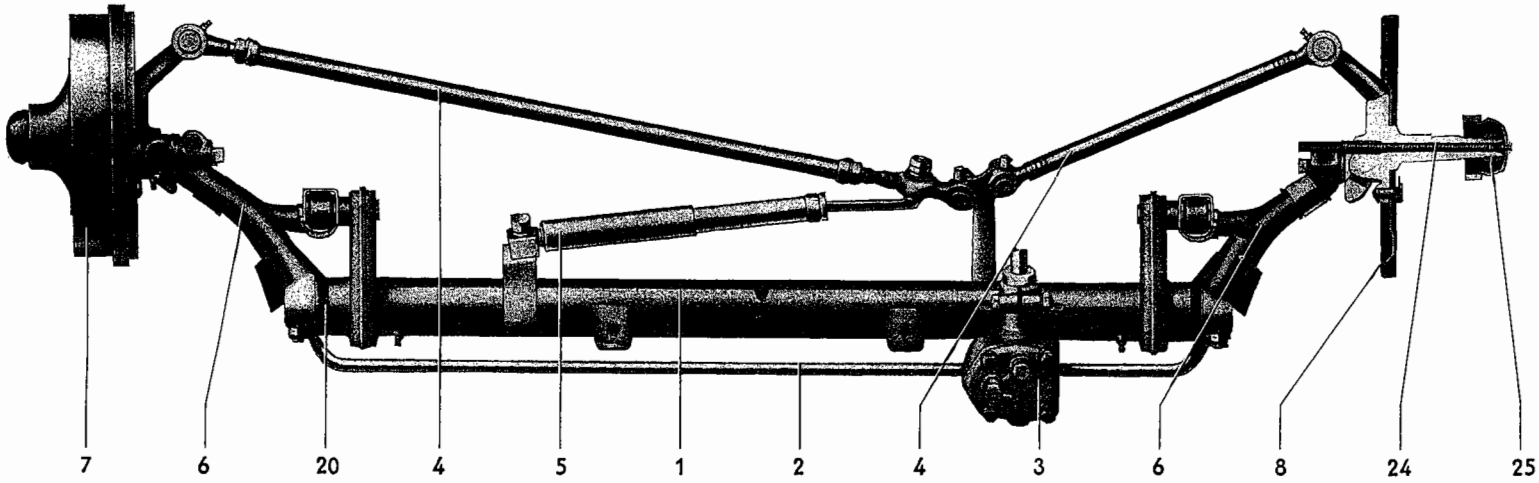
1 - Check and adjust front wheel bearings.
2 - Check and adjust torsion arm link pins.
3 - Check and adjust toe-in of front wheels.
4 - Check and adjust play in the steering.
5 - Check tie rods and steering gear for tightness.
6 - Check operation and mounting of shock absorbers and steering damper.
7 - Check wheel mounting bolts for tightness.
8 - Check and correct tire pressures.

Volkswagen Front Axle

(Sectional View)







1 Front axle tubes
2 Stabiliser
3 Steering gear
4 Tie rods
5 Steering damper
6 Torsion arm
7 Brake drum
8 Brake back plate
9 Torsion bar
10 Shock absorber
11 Torsion arm link
12 Stub axle (steering knuckle)
13 Torsion arm link pin
14 Dust excluder
15 King pin
16 Thrust bearing
17 Front wheel bearing, inner
18 Front wheel bearing, outer
19 Center anchor
20 Seal
21 Needle bearing for torsion arm
22 Bush for torsion arm
23 Rubber stop
24 Speedometer cable
25 Grease cap

Removing and Installing Front Axle

Removal

1 - Loosen wheel bolts, raise the car and take off front wheels.

2 - Turn off the fuel tap, disconnect operating rod from tap and pull off fuel hose.

3 - Remove protection cover at back of instrument panel and luggage compartment and take out fuel tank.

4 - Jack up the car, and lower it on to trolley or trestles.

For this the following auxiliary equipment may be used:

To lift:

Volkswagen hoists
Front axle jack VW 606
Trolley jack

To lower:

Vehicle trolley VW 603/1

To support:

Trestle VW 633

5 - Disconnect brake hoses at brake back plates and plug them up, using wooden plugs.

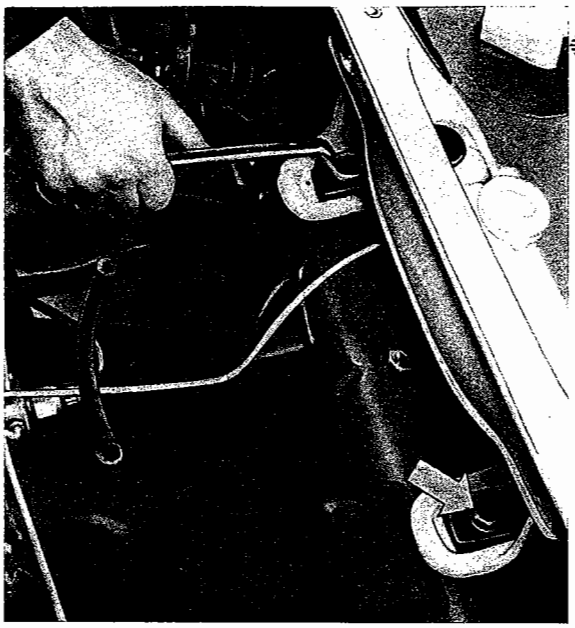
Important — When replacing the front axle, the brake cables must remain on the axle.

6 - Take off steering damper from front axle tube bracket.

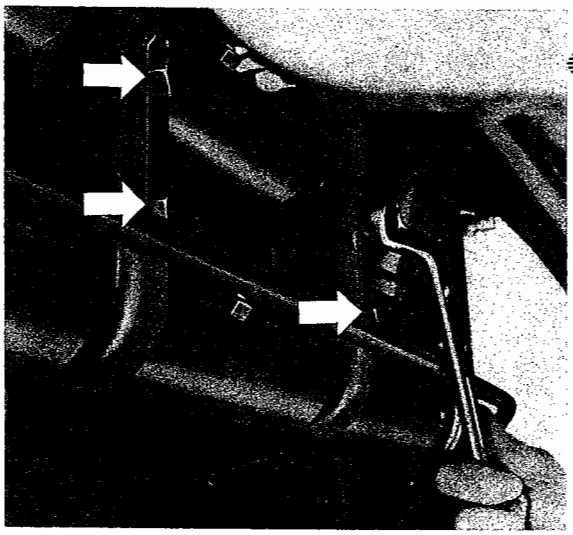
7 - Remove speedometer cable at front wheel.

8 - Loosen steering column clamp, pull off horn cable and withdraw steering column with steering wheel from steering coupling.

9 - After unlocking and unscrewing the nuts with VW 266f, pull off the tie rod joints and remove the rods.



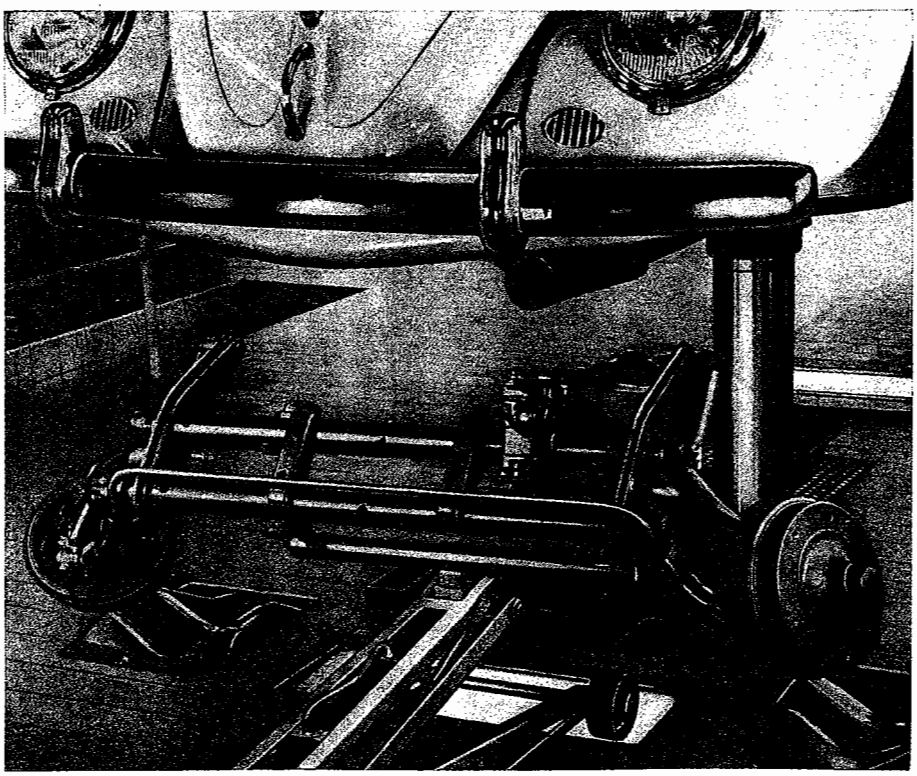
10 - Remove the two body mounting bolts M 10.



11 - Remove the four front axle mounting bolts, after the lock plates have been prised off, and take off the front axle.

The lower front axle mounting bolts become accessible and can be removed if the stabilizer is pressed down slightly. Insert a piece of wood between the axle tube and stabilizer and use it is a lever.

12 - To remove the front axle the best method is to use the front axle cradle in conjunction with the trolley jack VW 610.



Installation

This is accomplished by reversing the removal procedure, but the following points should be observed:

1 - Before installing the front axle, place a rubber packing on each of the threaded bushes on the axle beam.

2 - Use new lock plates.

3 - Tighten the front axle mounting bolts to 5.0—6.0 mkg (36—43 ft. lbs.).

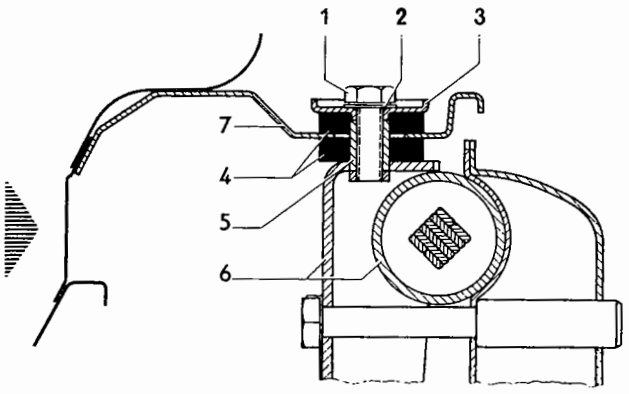
4 - Tighten two body bolts M 10 to 3.0 mkg (21 ft. lbs.).

5 - Tighten the tie rod end nuts and secure with a cotter pin.

6 - Make sure that there is a good ground connection at the steering column coupling.

7 - When pushing the steering column on the coupling flange pin, make sure that the steering wheel is properly positioned. Secure steering column clamp screw with a new lock plate.

8 - Install the steering damper bolt in the front axle beam bracket with a new lock plate and secure the bolt.



1 - Body mounting bolt
2 - Lockwasher
3 - Spacer
4 - Rubber packings
5 - Threaded bush
6 - Front axle
7 - Body

9 - Take care that the brake hoses are not twisted. Bleed braking system and adjust brakes.

10 - Check toe-in and camber of the wheels and caster of the axle tubes.

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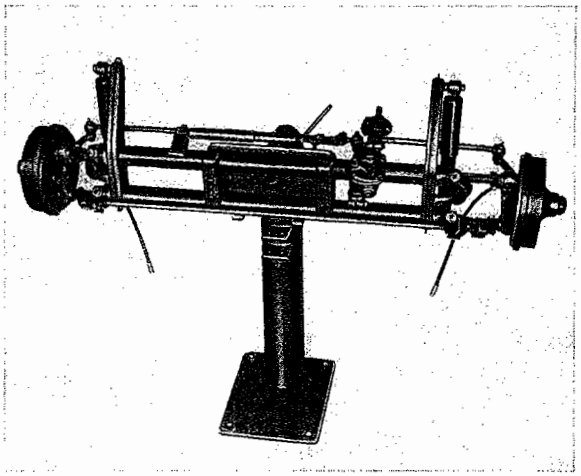
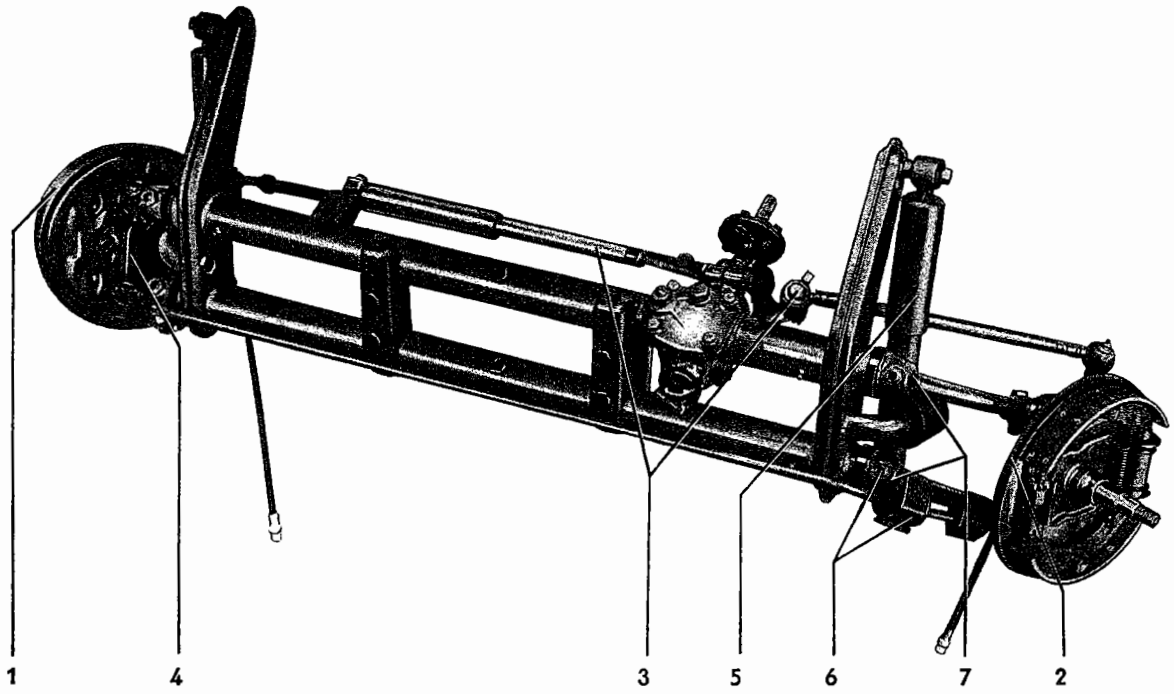
Disassembly and Assembly of Front Axle

General

As the front axle can also be partly disassembled while in position in the vehicle, repairs can generally by effected without having to remove the axle.

All operations to be carried out on the removed front axle can best be accomplished with the axle mounted on the Holding Fixture VW 643 in conjunction with the plate VW 309.





To facilitate disassembly and assembly, the following sequence of operations should be followed:

Disassembly

1 - Remove brake drums.

2 - Remove brake back plates.

3 - Remove tie (track) rods and steering damper.

4 - Remove torsion arm links and stub axles (steering knuckles).

5 - Remove shock absorbers.

6 - Remove torsion arms and stabilizer.

7 - Remove torsion bars.

Assembly

Assembly is accomplished by reversing the above procedure. The hints given on the following pages should, however, be observed.

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Brake Drums and Front Wheel Bearings

Removing and Installing Brake Drum

(Front axle in situ)

Removal

1 - Remove the hub cap and loosen wheel mounting bolts.

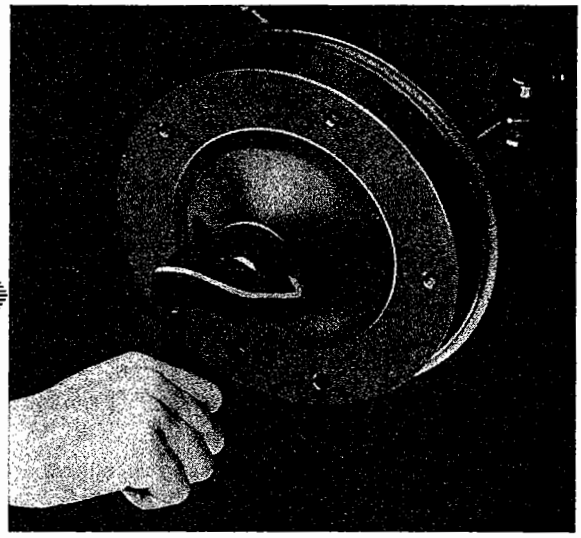
2 - Jack up the car or support on trestles.

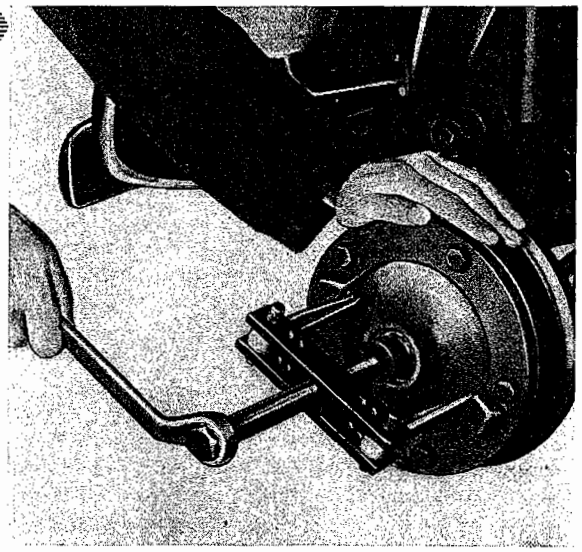
3 - Remove the wheel.

4 - On the left-hand front wheel: Remove the cotter pin securing the speedometer drive cable. Pull off inner hub cap with VW 637.

5 - Turn up lock plate and remove nuts and thrust washer (at left stub axle: left-hand thread!).

6 - Pull off the brake drum with the special tool VW 202 in conjunction with ring VW 202c, hooks VW 202d and thrust pad VW 202i. The nose of the thrust pad must engage in the slot cut in the wheel spindle.





Installation

This is a reversal of the above operations, but the following points should be observed:

1 - Check tapped holes of brake drum for damage and make sure that the braking surface is smooth.

2 - Clean brake drum hub and front wheel bearing carefully. Lubriate front wheel bearing and brake drum hub as prescribed under lubricant specifications.

3 - Adjust front wheel bearing as prescribed.

Reconditioning Brake Drum

Re-Tapping Brake Drum Holes

Brake drums with damaged threads for the wheel mounting bolts can be repaired by cutting a thread M 14 × 1.5 in the five tapped holes M 12 × 1.5 of the drum. Oversize wheel bolts M14 × 1.5 are available to suit the enlarged holes.

1 - Bore up the brake drum holes with a drill 12.0—12.1 mm dia. (0.470—0.474″).

2 - Cut thread M 14 × 1.5.

Important
Oversize wheel bolts must be tightened to between 11.0 and 13.0 mkg (79—93 ft. lbs.).

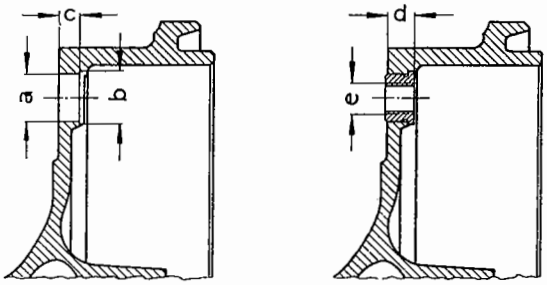
Tapped Inserts for Brake Drum Holes
(Part No. 111405619)

Another method of reconditioning brake drums having damaged threads is to press tapped inserts M 12 × 1.5 into the brake drum holes.

1 - Bore up the five brake drum holes with drill 17.8 mm dia: (.7008″).

2 - Ream the holes with reamer 18 H 8 = 18.000 — 18.027 mm (a). (.7087—.7097″).

3 - Counterbore the holes with a drill 20.0—21.5 mm dia. (.7874—.8466″) (b) so that a wall thickness of 8.0—8.3 mm .3150—.3268″ (c) remains.



a - 18 dia. H 8 = $\frac{18.027}{18.000}$ mm dia. $\left(\frac{.7097}{.7087}\text{ ins. dia.}\right)$

b = $\frac{20.0}{21.5}$ mm dia. $\left(\frac{.7874}{.8466}\text{ ins. dia.}\right)$

c = $\frac{8.3}{8.0}$ mm $\left(\frac{.3268}{.3150}\text{ ins. dia.}\right)$

d = $\frac{10.3}{9.8}$ mm $\left(\frac{.4055}{.3858}\text{ ins. dia.}\right)$

e = M 12 × 1.5

4 - Press the tapped inserts into the brake drum holes. The dimension 9.8—10.3 mm (d) must be strictly adhered to. The chamfered portion 0.5 × 45° of the insert may project from the brake drum surface, but never the knurled portion.

Use of Heli-Coil Tapped Inserts

The tapped holes can also be reconditioned by using Heil-Coil tapped inserts. The threads have to be recut and M 12 inserts screwed in. In this case new wheel bolts M 12 × 1.5 have to be used.

Refacing Brake Drum

If the braking surface of the drum is scored, out-of-round or bell-mouthed, it may be refaced on a lathe.

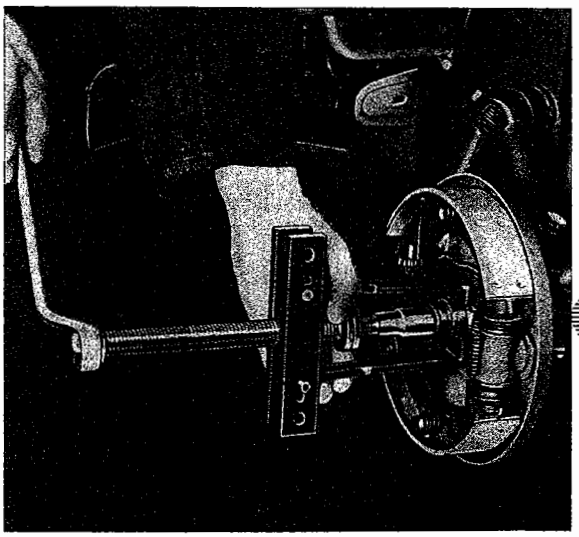
1 - Turn the drum to an inside diameter of 231.5 mm (9.11″). The thickness of a refaced drum must never be below 4 mm (0.16″). The braking surface must not be tapered more then 0.1 mm (.004″).

The permissible lateral and radial run-out of the drum is 0.25 mm (.010″).

2 - The brake shoes of refaced drums must be fitted with oversize brake linings to correspond with the radius of the braking surface.

Removing and Installing Front Wheel Bearings

(Front axle in situ)



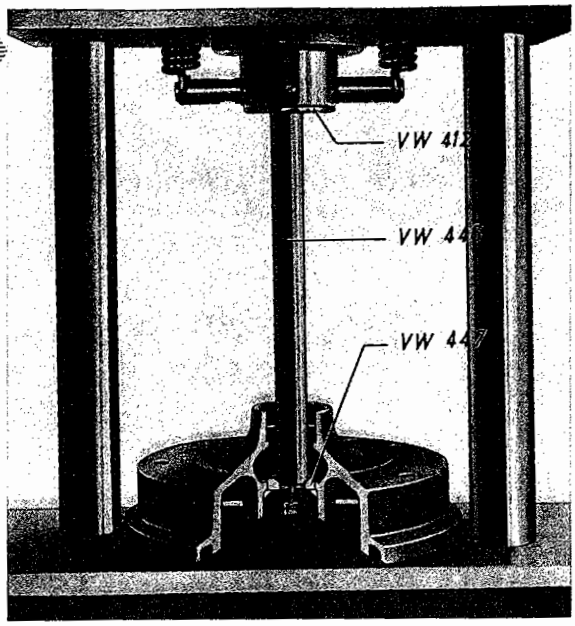
Removal

1 - Remove brake drum.

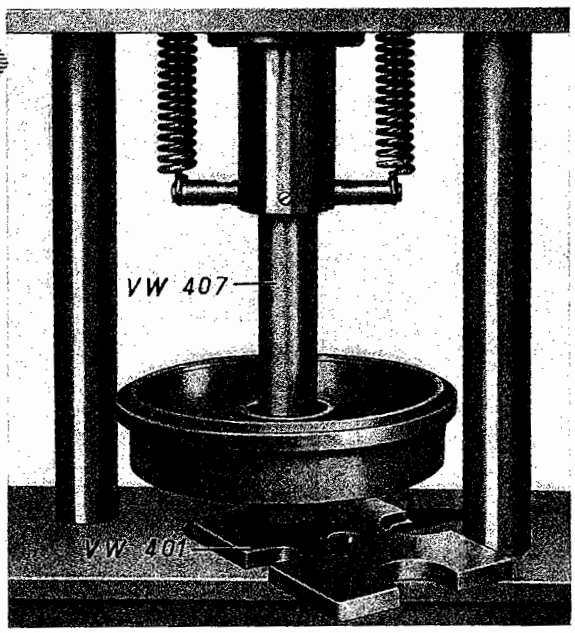
2 - Pull off the spacer and the inner race of the inner bearing by means of the puller VW 202 in conjunction with hooks VW 202s and thrust pad VW 202i.

3 - Remove oil seal from inner bearing of drum and take out ball cage.

4 - Remove outer race of the inner bearing (62 mm dia.) on Repair Press VW 400 with thrust plate VW 447 in conjunction with VW 412 and VW 446.



5 - Remove outer race of the bearing (52 mm dia.) on Repair Press VW 400 with punch VW 407 in conjunction with VW 401.



Installation

This is accomplished by reversing the above procedure, but the following points should be observed:

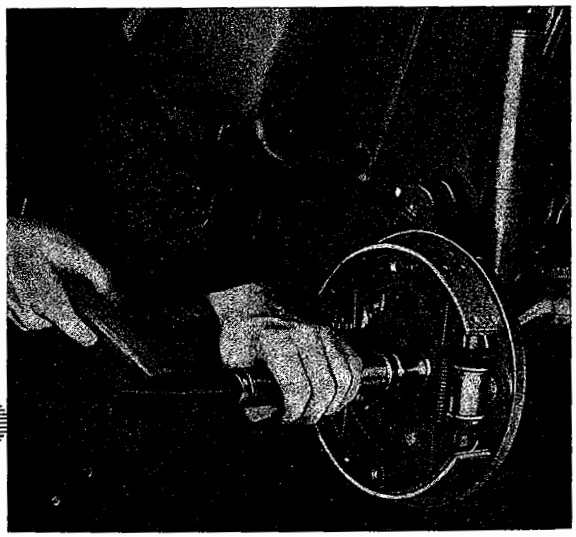
1 - Before installing the brake drum, clean the brake shoes and brake back plate thoroughly with compressed air. Dirt and dust produced by lining wear have an abrasive effect if allowed to enter the bearings and seatings. If the outer bearing race is no longer a press fit in the drum, the latter must be renewed.

2 - Thoroughly clean the wheel spindle and bearing chambers between the seatings of the brake drum with benzine and dry with a clean rag.

3 - Clean old grease from the ball races, cages and balls of the bearings. This grease must be removed completely. The best method is to thoroughly wash out the bearings.

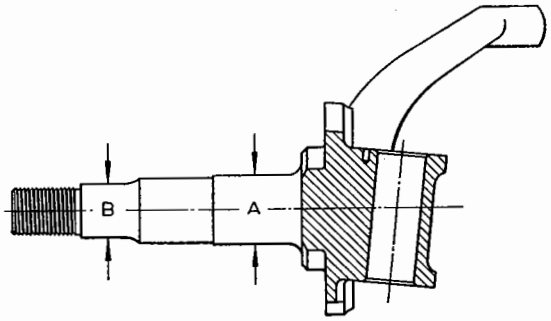
4 - Carefully inspect the bearings for pits, cracks, or other signs of wear. If necessary, use new bearings.

Important — Ball races or balls must never be replaced separately.



5 - Inspect spacer of inner bearing for cracks and wear, replace if necessary, using the sleeve VW 244 to drive it into position. A correct sealing of the brake drum oil seal is only insured, if the surface of the spacer is absolutely clean and smooth.

6 - Install inner ball race of inner bearing with sleeve VW 244. If the seating surfaces for the inner ball races have become worn by repeated removal and the adhesion or sliding fit is no longer present, a new stub axle must be used.



Seating A for inner bearing 25_{h6} = 25.000 mm dia. / 24.987 mm dia.

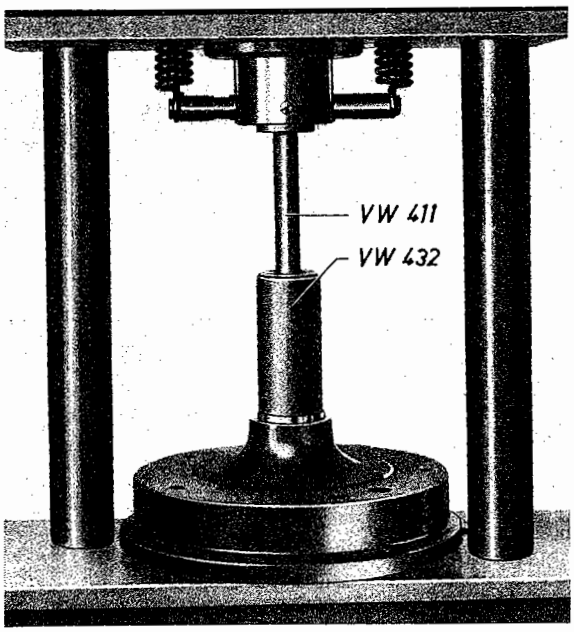
0.9843 in. dia. / 0.9837 in. dia.

Ball bearing inner dia. = 25.00 mm / 25.01 mm

Seating B for outer bearing 20_{g5} = 19.993 mm dia. / 19.984 mm dia.

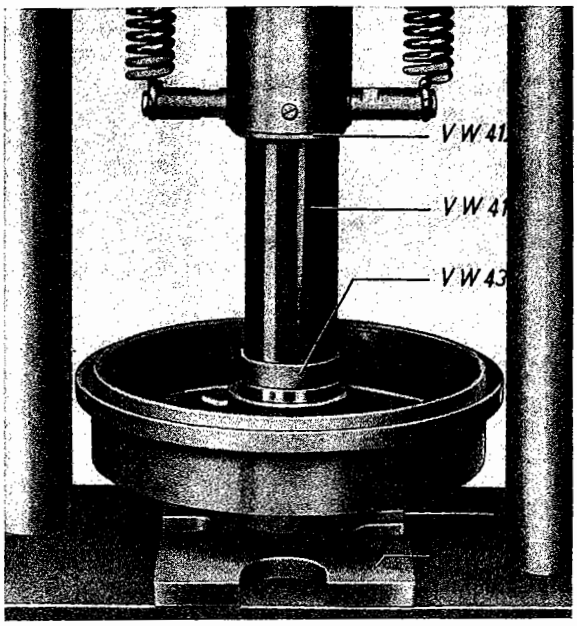
0.7871 in. dia. / 0.7868 in. dia.

Ball bearing inner dia. = 20.00 mm / 20.01 mm

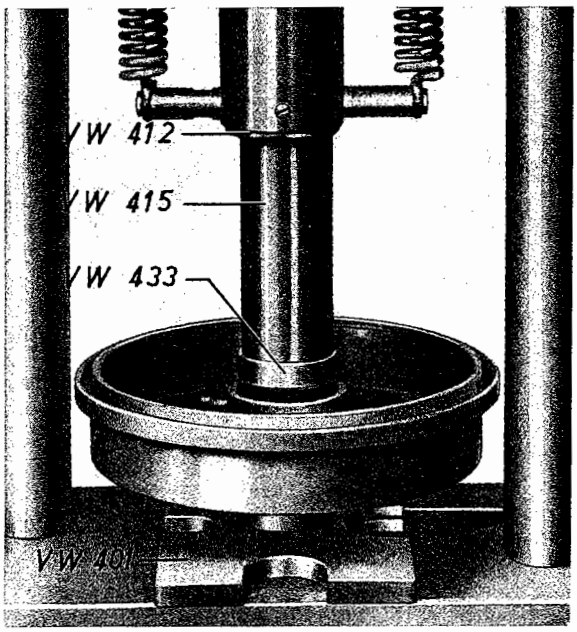


7 - Install outer race of outer bearing on VW Repair Press with thrust mandrel VW 432 in conjunction with VW 411.

8 - Install outer race of inner bearing on VW Repair Press with thrust block VW 433 in conjunction with VW 401, 412, and 415. Insert the ball cage.



9 - Press in the oil seal on the Repair Press with thrust block VW 433 in conjunction with VW 401, 412, and VW 415. Ensure that the oil seal is correctly seated.



Check oil seal for wear. If in doubt, renew.

10 - Lubricate bearings with grease of the specified grade. Press the grease well into the cages and between the balls. Apply a light film to the seatings and to the surfaces of the ball races. Only use grease of proven brands.

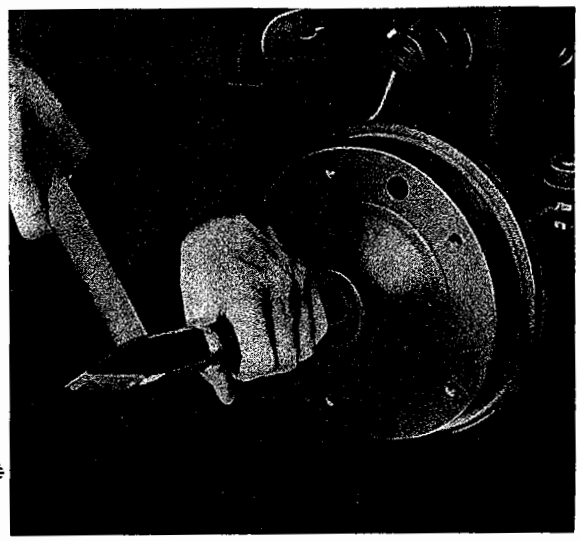
Important

Mixing greases of different brands or types can have harmful after-effects and is to be avoided at all costs.

Too much grease can also be harmful.

11 - During lubrication and assembly take care to prevent dirt or foreign matter from entering.

12 - Install brake drum and drive the inner race of the outer bearing into position, using sleeve VW 244.



13 - Make sure the thrust washer is correctly positioned. A tilted washer causes maladjustments.

14 - Use new lock plate.

15 - Adjust bearings as specified.

Testing and Adjusting Front Wheel Bearings

Maladjustment of the wheel bearings leads sooner or later to damage or destruction of the bearings. If they are too loose, the whole load of the front axle is taken by only a few balls, resulting in scoring due to fatigue of the ball races and the balls.

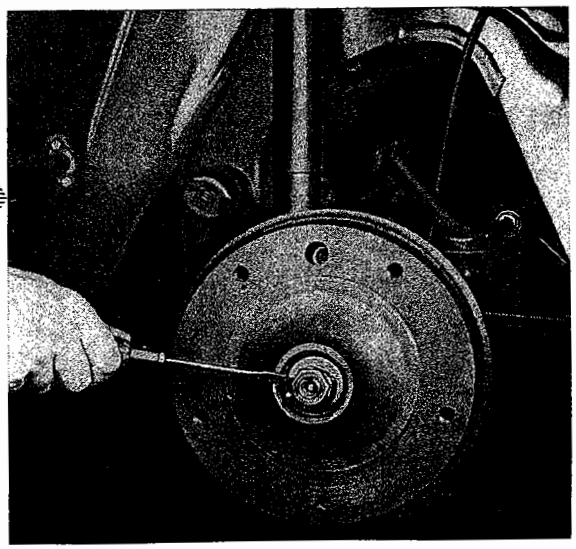
If the bearings are too tight, the balls are subjected to excessive pressure and consequently become overloaded until they finally collapse.

Close attention must therefore be paid to the instructions in the section "Testing and Adjusting Front Wheel Bearings".

Checking adjustment

1 - Take off grease cap from brake drum using VW 637.

2 - Adjustment is correct if the thrust washer at the outer bearing can just be moved laterally by a screwdriver and if no axial bearing play can be felt when rocking the brake drum.

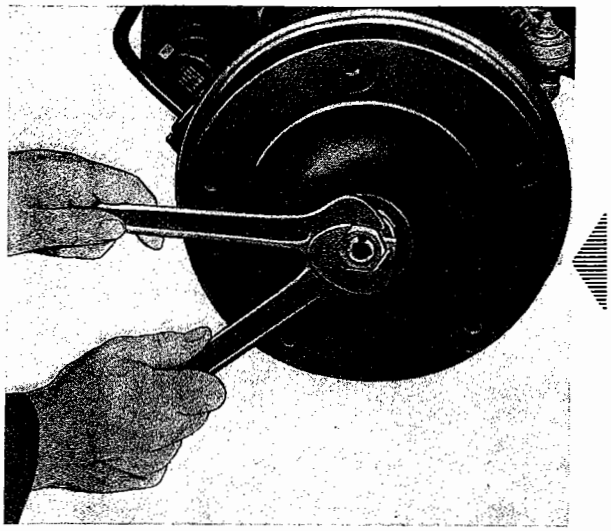


Adjustment

1 - Pry up noses of lock plate at stub axle (steering knuckle) nuts.

2 - Loosen nuts by means of the two open end wrenches 27 mm, VW 113.

3 - Use a new lock plate.



4 - Tighten inner nut until the thrust washer at the outer bearing can just be moved laterally by a screwdriver and no axial bearing play can be felt when rocking the brake drum. Failure to observe this instruction could cause the inside nut to be tightened up immediately to the prescribed clearance, so that when the lock-nut is tightened up, it will exert and additional pressure on the inner nut, owing to backlash, thus neutralizing the original bearing play.

5 - Secure nut by alternately bending down nose of lock plate.

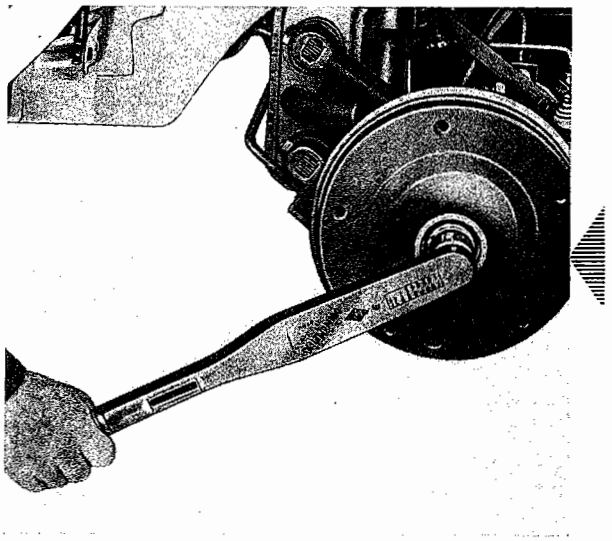
The front wheel bearing adjustment is supplemented by the following procedure which is based on exact values for tightening and backing off the inner nut.

For this procedure the following tools are required:

1 - Torque wrench, suitable for 4 mkg (29 ft. lbs.) with 27 mm socket (if necessary with $^3/_4''$—$^1/_2''$ reducing adapter).

2 - 1 set of open end 27 mm wrenches VW 113.

Sequence of Operations:



1 - Pry up noses of lock plate and unlock nuts.

2 - Loosen nuts by means of the open and wrenches 27 mm — VW113. Remove outer nut and lock plate.

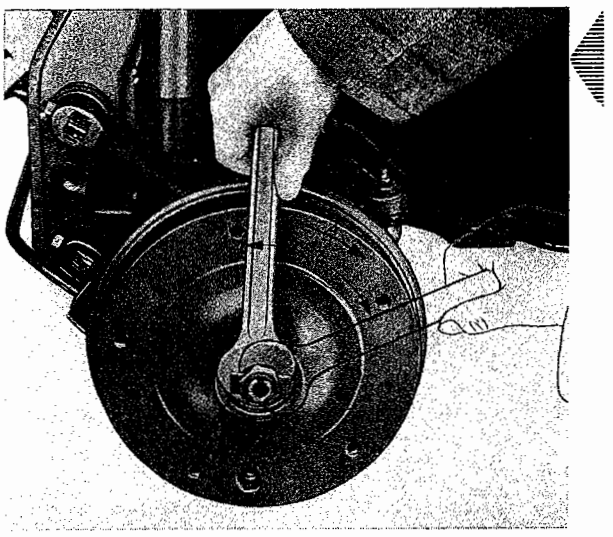
3 - Tighten inner nut to a torque of 4.0 mkg (29 ft. lbs.).

4 - Install new lock plate.

5 - Loosely screw on outer nut.

6 - Loosen inner nut 72 degrees by means of the offset open end wrench 27 mm — VW 113 as follows:

Put open end wrench onto inner nut. Align one tapped hole with the edge of the open end wrench. Back off the nut until edge of open end wrench is aligned with the next hole in the brake drum.



A = Direction of Loosening α = Angle of Loosening = 72°

7 - Tighten outer nut.

Important

Adjustment is correct if the thrust washer at the outer bearing can just be moved laterally by a big screwdriver and if no bearing play can be felt when rocking the brake drum.

8 - Secure nuts by alternately bending down nose of lock plate.

Adjusting Torsion Arm Link Pins

General

The adjustment of the torsion arm link pins must be checked at regular intervals as specified for the maintenance service, and corrected if necessary.

Inspection

1 - Raise front end car.

2 - Rock the wheel by hand to check for end play between torsion arm link and torsion arms. If play is present, adjust torsion arm link pins.

Adjustment

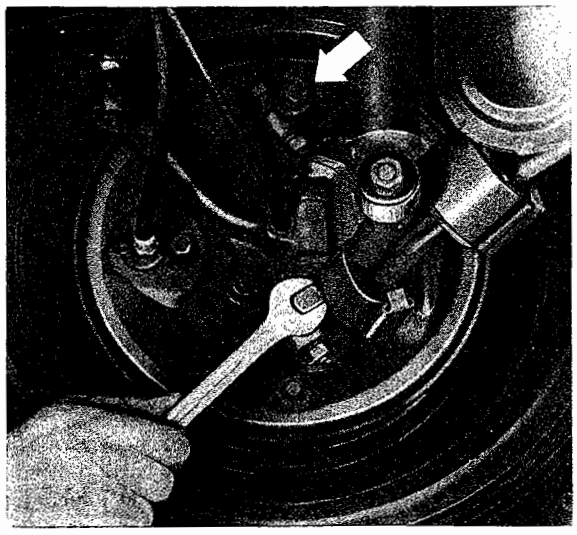
1 - Raise front end of car. To adjust the torsion arm link pins the weight must always be taken of the wheels.

2 - If necessary grease king pins and torsion arm link pins.

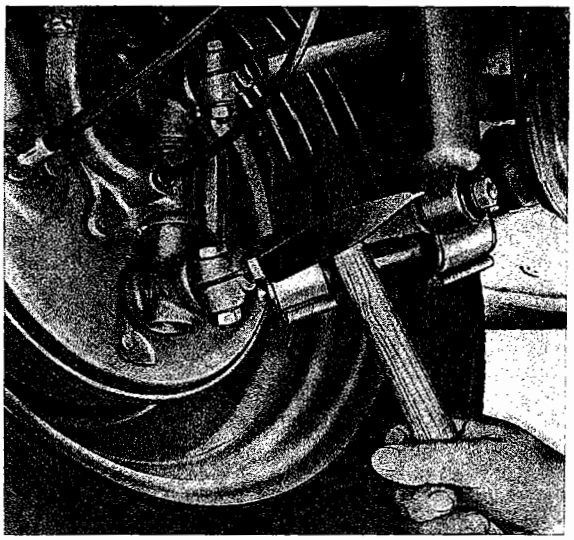
3 - Back off pinch bolts at torsion arm eyes.

4 - Fully tighten the link pins and then back off 1/8 of a turn. Retighten the link pins until the first light resistance of the shoulder making contact is felt. This corresponds to a slackening angle of about 10—12°.

If the adjustment has no effect the shims are worn and must be replaced.



5 - Tap the ends of the link pins lightly to free the tension caused between the parts when the pins were fully tightened.



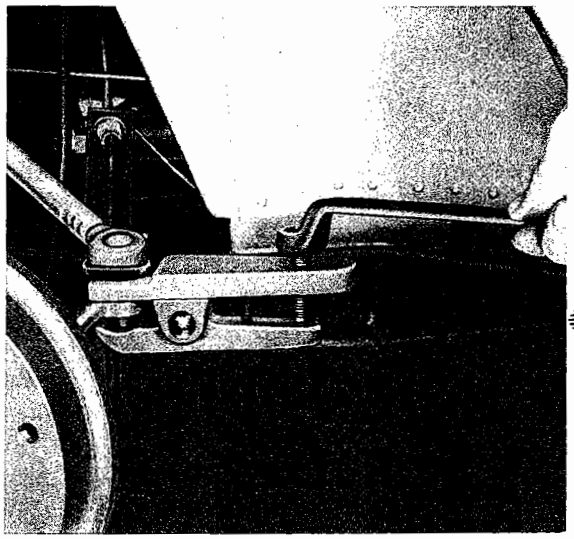
6 - Tighten pinch bolts in the torsion arm eyes.

These adjustments should be followed carefully. If the torsion arm link pins are adjusted too tightly the action of the torsion arm needle bearings and consequently the desired freedom of spring movement will be affected. On the other hand the link pins should not be adjusted too loosely or show any perceptible play.

Important

After the torsion arm link pins have been adjusted, it is absolutely necessary to check the toe-in.

Removal and Installation of Torsion Arm Link Complete with Stub Axle (Steering Knuckle) (Front axle in position)



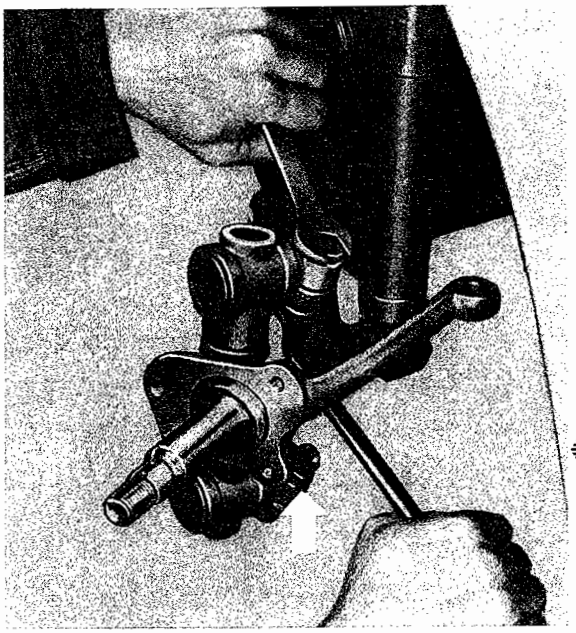
Removal

1 - Raise front end of car and if necessary, support it behind the frame head.

2 - Remove front wheels.

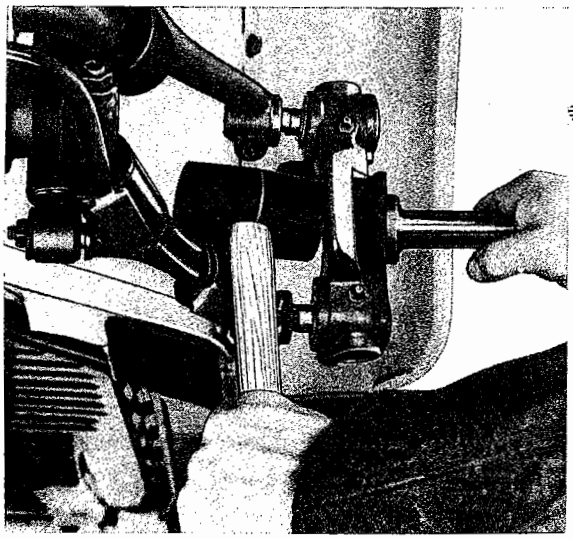
3 - Left front wheel: detach speedometer cable.

4 - Remove outer tie rod with tool VW 266f.



5 - Remove brake drum and brake back plate. It is not necessary to detach the brake hose.

6 - Remove pinch bolts at torsion arm eyes.



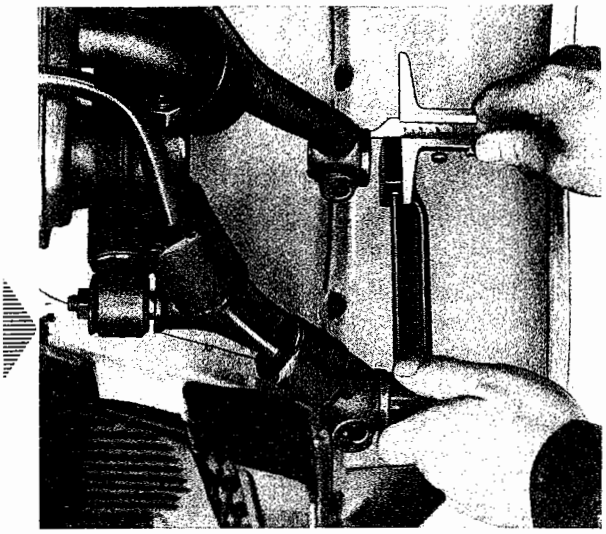
7 - Remove torsion arm link and stub axle by equally driving out both torsion arm link pins.

Installation

This is a reversal of the above procedure, but the following points should be observed:

1 - Check for wear and replace as necessary: torsion arm link pins, torsion arm link pin bushes, shims, and retainer with dust excluder.

2 - Examine faces of torsion arm eyes for wear and roughness. If necessary, reface them with cutter VW 217.



3 - Using gauge VW 270a, measure offset of eye faces, which should be 7 mm (0.28″). Departures from that dimension must not exceed ± 1.5 mm (0.06″). Correct the offset with shims of 0.5 mm (0.02″) thickness.

The installation of the retainer reduces the total number of shims from 10 to 8.

Arrangement of Shims on Torsion Arm Link Pins

Offset in mm	Number of Shims for			
	Upper Torsion Arm		Lower Torsion Arm	
	Inner Shims (A)	Outer Shims (B)	Inner Shims (C)	Outer Shims (D)
5,5	2	6	5	3
6	2	6	4	4
6,5	3	5	4	4
7	**3**	**5**	**3**	**5**
7,5	4	4	3	5
8	4	4	2	6
8,5	5	3	2	6

Note:

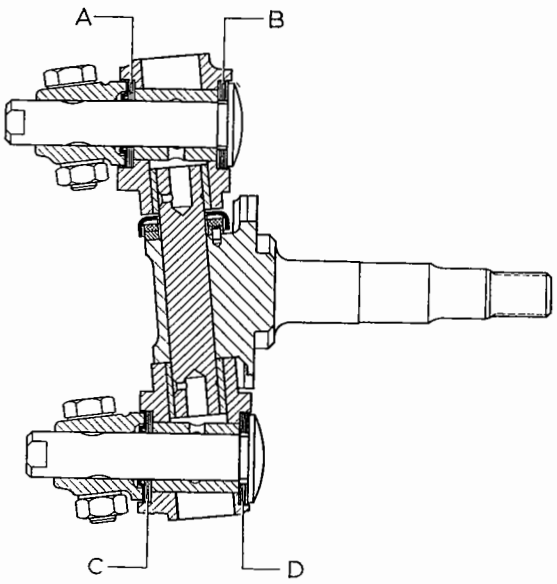
a - There must always be 8 shims and one retainer with dust excluder fitted to each torsion arm link pin.

b - If the offset is 7 mm B and D have 5 shims each and A and C 3 each.

c - If the offset is in excess of 7 mm, shims should be added to A and removed from C.

d - If the offset is below 7 mm, shims should be removed from A and added to C.

e - Number of shims at B and D should always be brought up to 8.



Example:

a - The measurement of the offset is 8.2 mm. The value measured is rounded off, in this case to 8.0 mm.

b - The deviation from the nominal dimension (7 mm) is 8.2—7 = **1.2 mm.** This value corresponds to the thickness of 2 shims of 0.5 mm each.

c - The shims must be arranged as follows:

Upper torsion arm		Lower torsion arm	
Inner Shims (A)	Outer Shims (B)	Inner Shims (C)	Outer Shims (D)
4	4	2	6

If deviation exceeds ± 1.5 mm, it is not permissible to add further shims. In order to locate the cause of the trouble the torsion arms must be removed and checked (gauge VW 282b) and the entire front axle assembly inspected (with front axle tube alignment gauge VW 256a).

Bent torsion arms must always be replaced. It is not permissible to straighten these parts.

Note:

If the torsion arm link offset (correct value: 7.0 mm) departs from the tolerance of ± 0.2 mm, this difference has to be considered when arranging the shims. Such a deviation is present when the torsion arm link offset reading which is measured with a depth gauge from the back of the gauge to the inner shoulder of the torsion arm link, is less than 19.8 mm or more than 20.2 mm. In this case, proceed as follows:

If the torsion arm link offset reading is less than 19.8, the difference between this reading and 20.0 mm has to be subtracted from the torsion arm offset. If the difference is more than 20.2 mm the amount over 20.0 mm is added to the torsion arm offset.

Example:

a - The torsion arm offset as previously measured is 8.2 mm.

b - The reading for the torsion arm link offset is accepted as being 20.3 mm.

c - The amount over 20.0 mm is:

20.3 — 20.00 = 0.3 mm.

d - The torsion arm offset is, therefore:

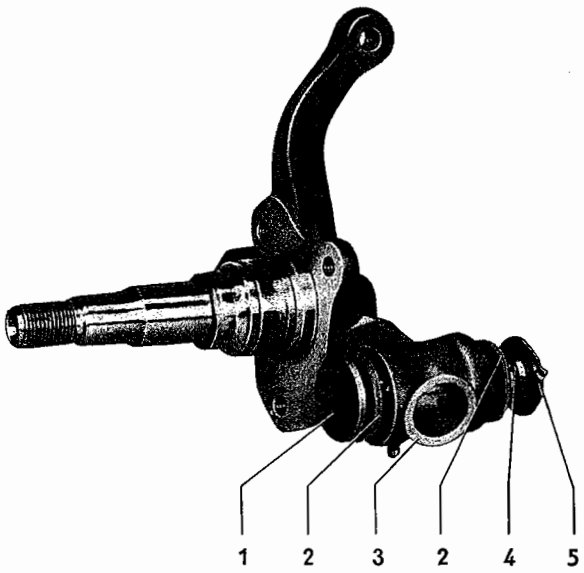
8.2 + 0.3 = 8.5 mm.

e - The shims should then be arranged as follows:

Upper torsion arm		Lower torsion arm	
Inner Shims (A)	Outer Shims (B)	Inner Shims (C)	Outer Shims (D)
5	3	2	6

4 - Insert torsion arm link pins and shims with universal grease. The dust excluder retainer and the dust excluder should be pushed on to the torsion arm link pin so that the dust excluder seats correctly and is not crushed.

If the offset has been taken into consideration, the torsion arm link pins can be inserted fully into the torsion arm eyes and the dust excluder retainers contact the upper and lower torsion arm eyes at the same time.



1 - Torsion arm link pin
2 - Shims
3 - Torsion arm link
4 - Dust-excluder
5 - Retainer for dust excluder

5 - When assembling, the dust excluder retainers should be turned so that their noses fit into the slots in the torsion arm eyes.

6 - Adjust torsion arm link pins.

7 - Bleed and adjust brakes.

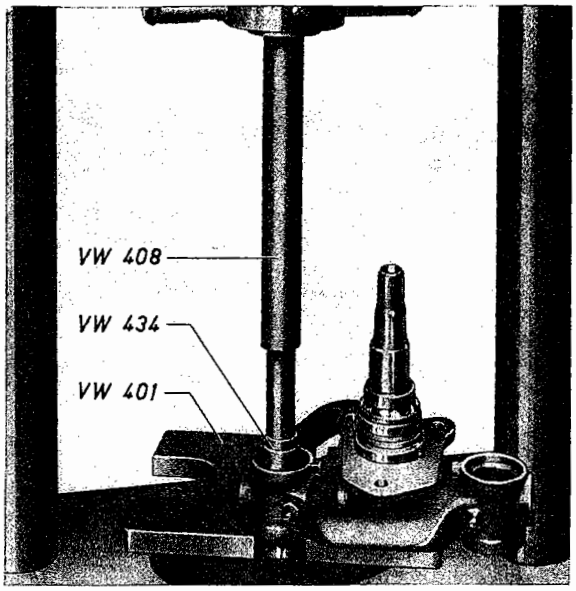
8 - Adjust front wheel bearings as specified.

9 - Check camber and toe-in of front wheels.

Removal

1 - Remove torsion arm link and stub axle (steering knuckle).

2 - Remove torsion arm link pin bushes on VW Repair Press with thrust mandrel VW 434 in conjunction with VW 408 and VW 401.



Installation

When installing torsion arm link pin bushes, the following points should be observed:

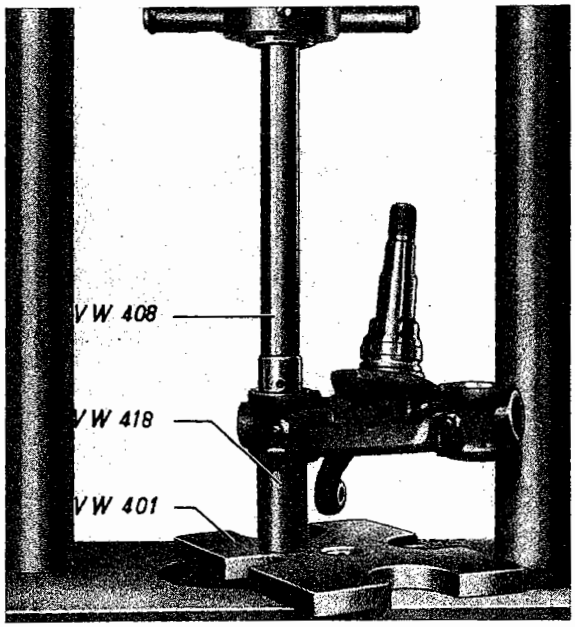
1 - Check depth of bores for torsion arm link pin bushes using gauge VW 259.

2 - Check torsion arm link for correct offset by means of gauge VW 259.

3 - Check clearance of king pin in the bushes. Replace pin and bushes if necessary.

4 - When inserting the bushes of the torsion arm link pins ensure that the lubrication passages are correctly positioned.

5 - Install bushes for torsion arm link pin on VW Repair Press with punch VW 408 in conjunction with VW 401 and VW 418. The bushes must be a force fit in the torsion arm link.



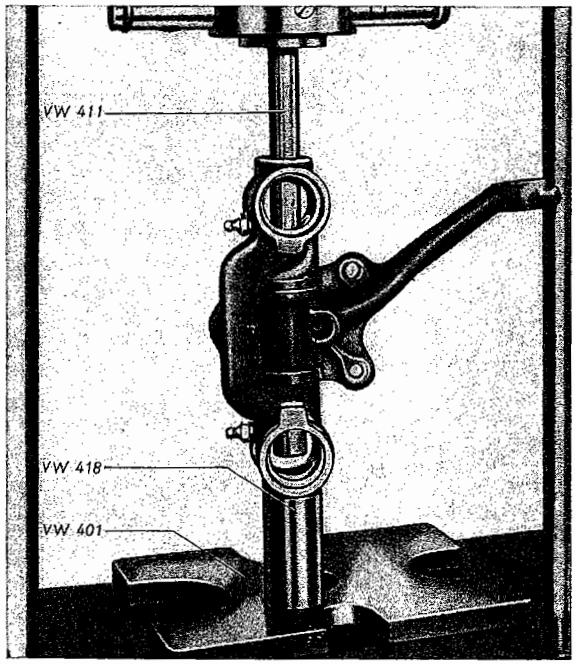
Removing and Installing Stub Axle (Steering Knuckle)

Removal

1 - Remove torsion arm link pin bushes.

2 - Drive out king pin on VW Repair Press with punch VW411 in conjunction with VW401 and VW418. To avoid damage, the stub axle should be heated in an oil bath to 80—90° C (175—195° F).

3 - Remove stub axle and thrust bearing assembly from torsion arm link.



Checking Stub Axle

1 - Pull off front wheel bearing spacer with extractor VW 202 in conjunction with VW 202 S and 202i.

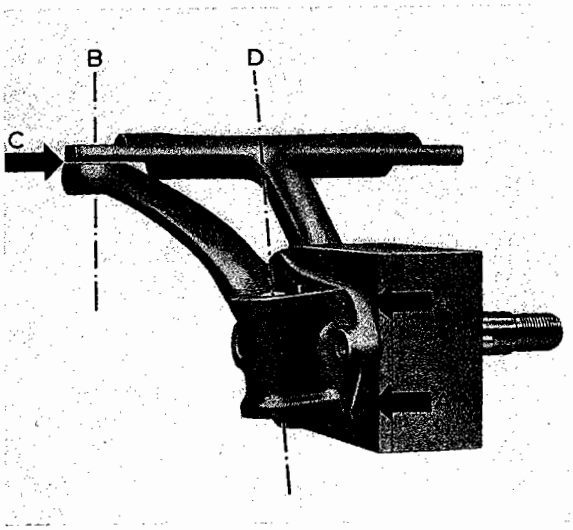
2 - Check the stub axle with gauge VW 258a for the following:

A - The face of the stub axle must be completely flush with the side of the gauge.

B - The bore in the stub axle steering arm must align with that in the gauge.

C - The face of the steering arm eye must be parallel to the corresponding surface of the gauge.

D - Condition of king pin bores. If the bore is worn as a result of king pin seizure, the stub axle must be replaced.



Important
Bent stub axles must not be straightened, but should be replaced.

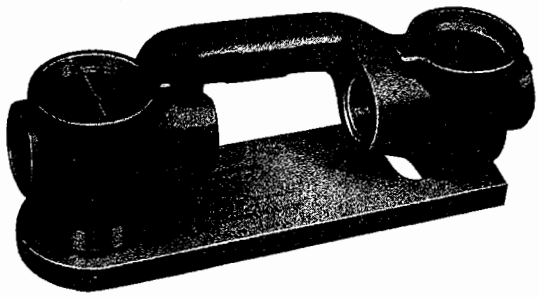
3 - Examine front wheel bearing seating surfaces on stub axle. If the seating surfaces for the bearings have become worn by repeated removal of the bearings to an extent that the correct seating of the inner races cannot be ensured, the stub-axles must be renewed.

4 - Inspect thrust washer contact surface on stub axle for smoothness and remove any burr.

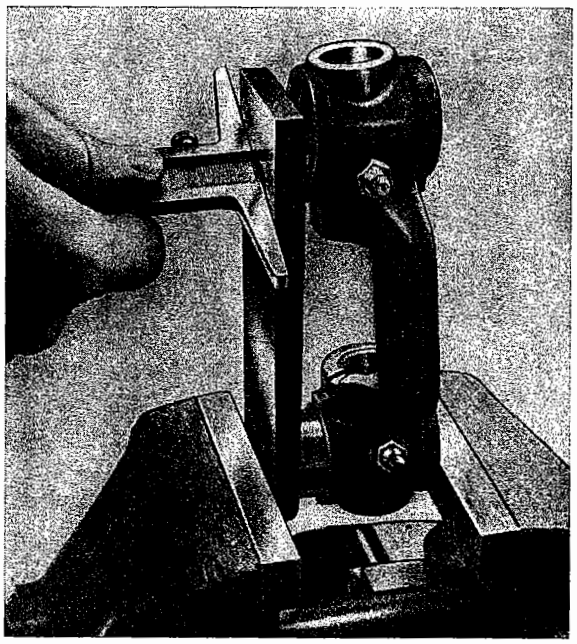
Checking Torsion Arm Link

1 - Drive out torsion arm link pin bushes.

2 - Inspect torsion arm link with gauge VW 259. The torsion arm link pin shims are positioned at the shoulder. These contact surface wear due to friction. The bores for the torsion arm link pin bushes should, therefore, be checked for sufficient length. The torsion arm link is placed



— first with its upper bore and then with the lower bore — over the mandrel of the offset gauge. The shoulder of the bores should be higher than the face of the mandrel. If this is not the case, install a new torsion arm link.



3 - Check the torsion arm link with gauge VW 259 for correct offset.

Correct offset 7.0 mm

Tolerance $\pm$ 0.2 mm

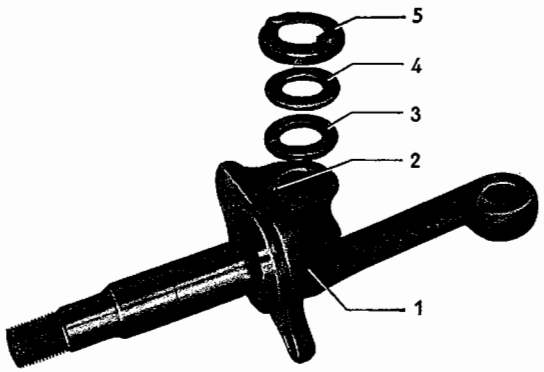
Place gauge and torsion arm link in a vise and measure the offset with a depth gauge. With the depth gauge contacting the back of the gauge, a dimension of 20.0 mm up to the shoulder of the torsion arm link, corresponds to an offset of 7.0 mm.

4 - Important:

a - If the reading exceeds 20.0 mm, the offset is less than 7.0 mm. If the reading is less than 20.0 mm, the offset exceeds 7.0 mm.

b - Readings between 19.8 and 20.2 mm which correspond to the tolerance of from 6.8 to 7.2 mm, are not taken into consideration. The torsion arm link can still be used provided that the bores for the torsion arm link pin bushes are sufficiently long.

c - If the torsion arm link offset reading is less than 19.8 mm or greater than 20.2 mm, such a deviation must be considered when arranging the shims as is described during the assembly of stub axle and torsion arm link.



1 - Stub axle (steering knuckle)
2 - Dowel pin
3 - Friction washer
4 - Plastic washer
5 - Cover

Installation

This is a reversal of the removal procedure but the following points should be observed:

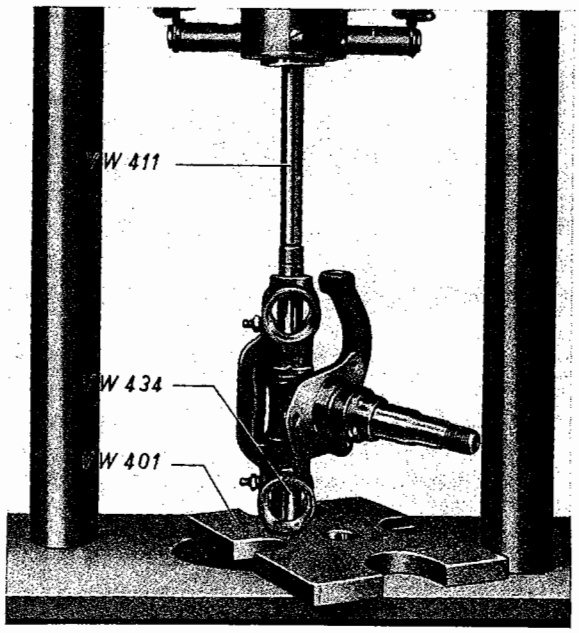
1 - Check king pin for wear. King pins must only be replaced together with the bushes in the torsion arm link.

2 - Inspect seating of thrust washer dowel pin in stub axle.

3 - The torsion arm link must be assembled with the stub axle and the thrust bearing (thrust washer, plastic washer and cover) so that no end play is evident. The assembly should take place with a preload of 0.02 $\pm$ 0.02 mm.

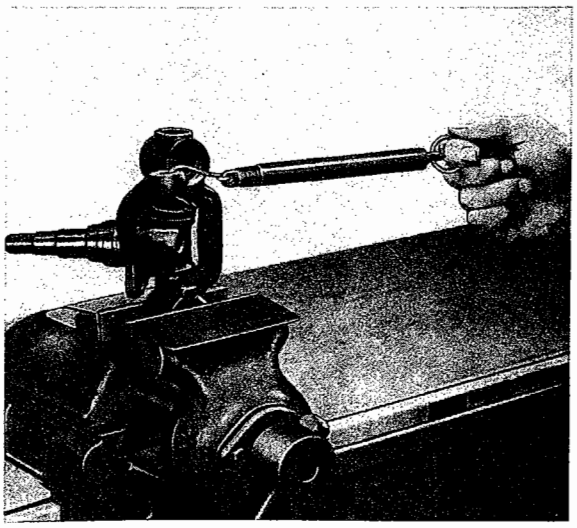
Any end play felt is eliminated by installing a thicker thrust washer. Steel thrust washer of various thicknesses from 3.56 — 3.63 — 3.68 — 3.73 mm etc. up to 4.08 and 4.30 mm are available.

The thrust washer is dowel-located in the stub axle and the cover is secured in position by slots in the torsion arm link.



4 - The king pin is a press fit in the stub axle and the stub axle must, therefore, be heated in an oil bath to approximately 80 °C (175 °F). Press in the king pin on the VW Repair Press with arbor VW 434 in conjunction with VW 401 and 411.

The torsion arm link and steering knuckle must be free enough to be turned by hand. If necessary, tap the parts several times with an aluminium mallet.



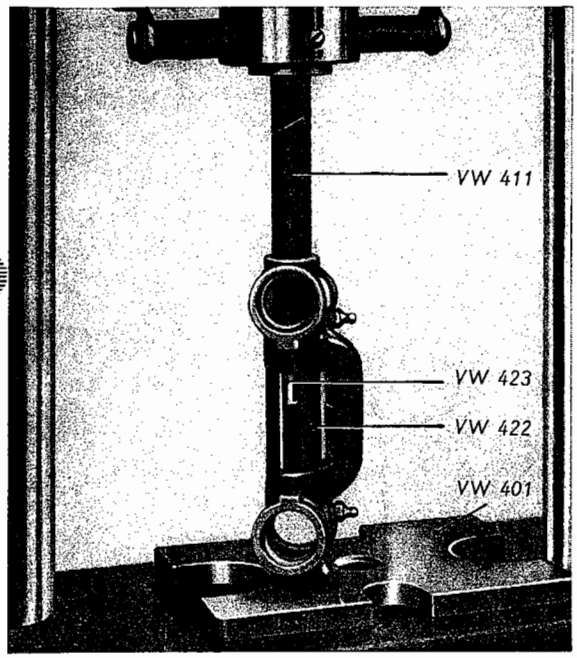
5 - In connection with the installed steering damper, it is of particular importance that the stub axle moves sufficiently free in the torsion arm link. The movement must be checked each time repairs are carried out, and it can best be done with a spring balance which is hooked into the stub axle arm. The force applied to move the arm should be a maximum of 2 kg (4.4 lbs.).

Removing and Installing King Pin Bushes

Removal

1 - Remove stub axle (steering knuckle).

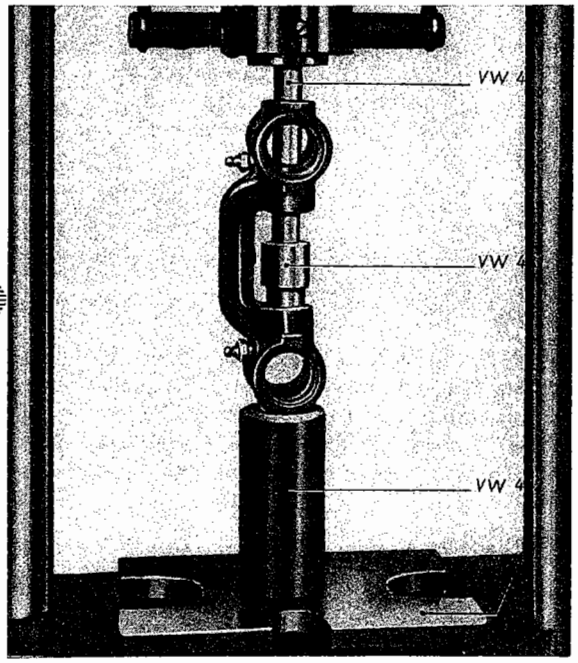
2 - Drive out king pin bushes on VW Repair Press with punch VW 411 in conjunction with VW 401, 422 and 423.



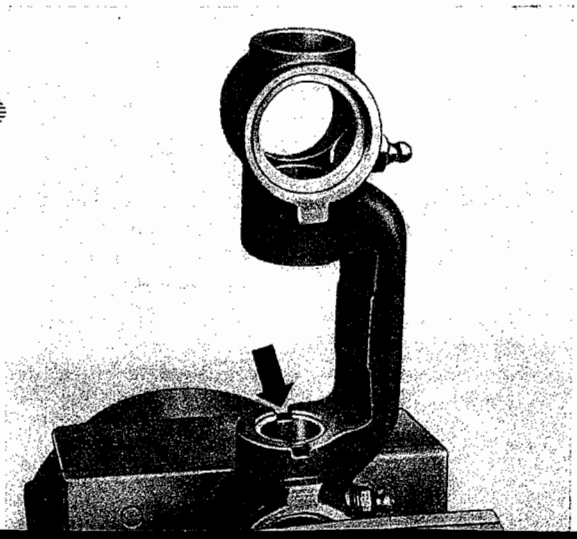
Installation

When installing king pin bushes, the following points should be observed:

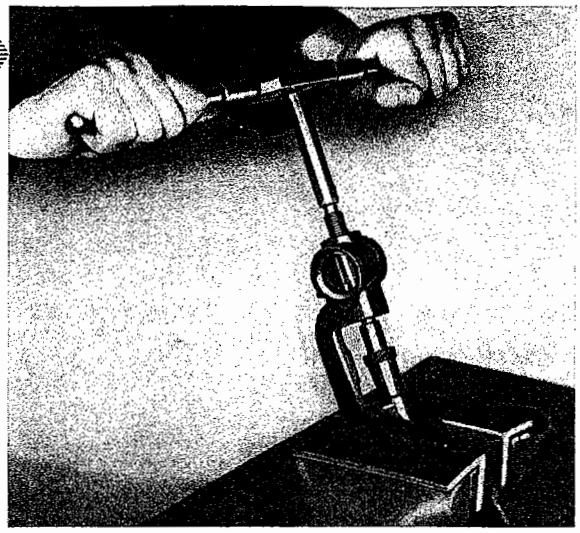
1 - Press in new bushes from inside of torsion arm link on VW Repair Press with punch VW 411 in conjunction with VW 431, VW 432 and VW 401.



2 - File slots in the upper bush for the thrust bearing locating lugs.



3 - Ream up bushes by means of reamer VW 224 (18—21 mm dia.). The tapered bush of the reamer serves as a guide.



Correct dia. $\frac{18.034 \text{ mm}}{18.016 \text{ mm}} = \frac{.7099''}{.7092''}$

Correctly reamed up bushes must be free from score and chatter marks, allowing the king pin to be turned by hand, without play being felt.

Note:

When reaming up the rolled and slit type bronze bush there is a possibility of the cutter becoming prematurely blunt.

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Removing and Installing Stabilizer

(With front axle installed)

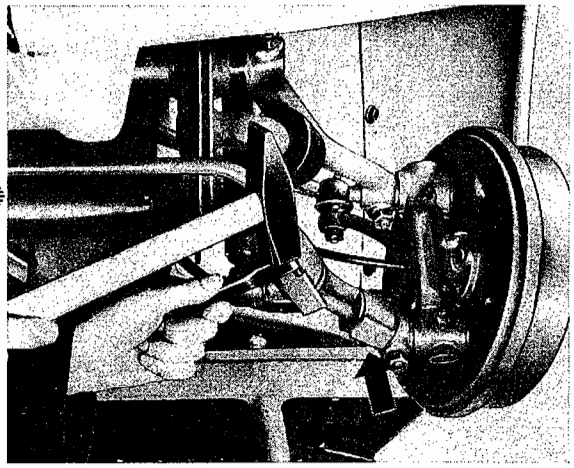
Removal

1 - Loosen wheel bolts, raise or support vehicle on trestles and take off front wheels.

2 - Bend up lugs of spring retaining clips and remove clips from inner and outer clamp on both sides.

3 - Expand the clamps and lift them off. Take off shims.

4 - Take off stabilizer and slide off the rubber cushions.

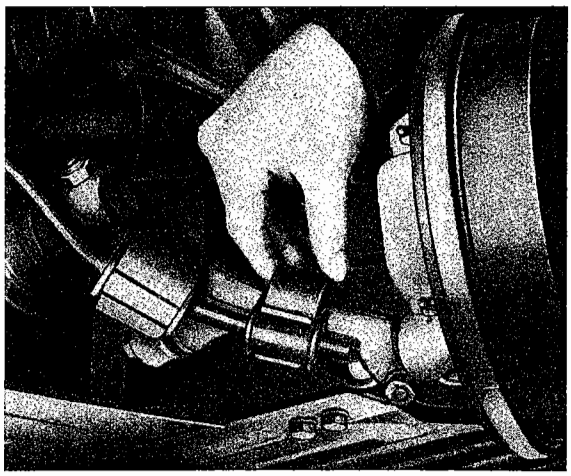


Installation

To install, reverse the preceding operations and observe the following points:

1 - Check stabilizer, rubber cushions, clamps, shims and clamp links for damage, replace as found necessary.

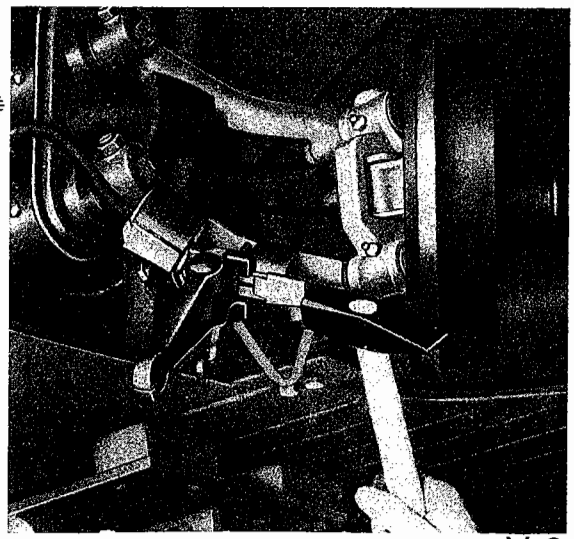
2 - The clamp edges are tapered. When installing, make sure that the edges of both clamps and links taper down toward the wheel.



3 - Make sure the inner clamps occupy a position which prevents them from fouling the shock absorbers during operation.

4 - Tension the clamp with a hand vise and position the retaining clips. The lug of the retaining clips must be towards the front axle tubes.

Secure the retaining clips by bending over the lug.

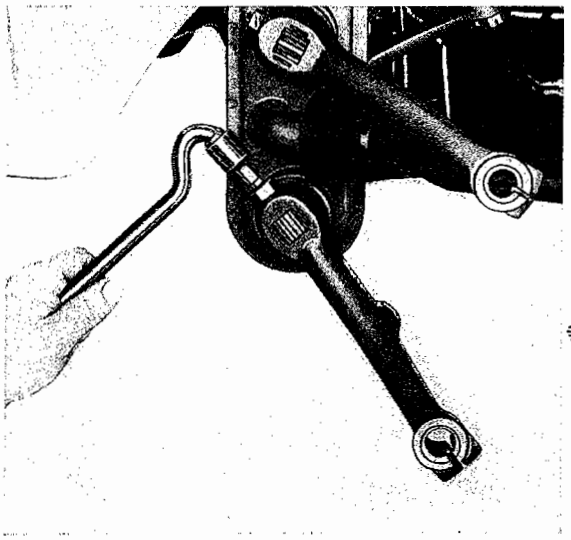


Note:

If the front axle with stabilizer is to be removed, the stabilizer must be pressed down slightly to give access to the lower front axle mounting bolts. It is best to insert a piece of wood between the axle tube and stabilizer and use it as a lever.

Removing and Installing Torsion Arms

(Front axle in situ)



Removal

1 - Remove torsion arm link and steering knuckle.

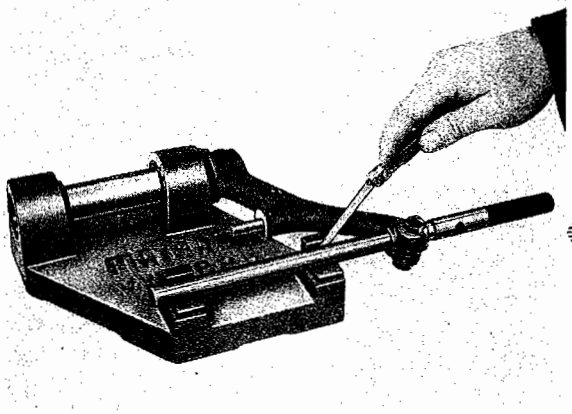
2 - Remove shock absorber.

3 - Remove the stabilizer.

4 - Remove lock nuts and set screws at torsion arms using offset handle VW 150 in conjunction with 8 mm key (VW 156).

5 - Take off torsion arm with dust seals.

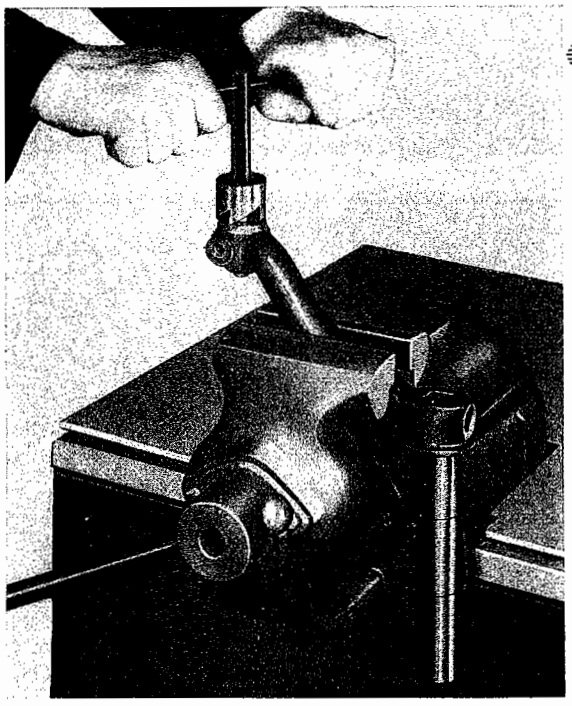
6 - Pull off torsion arm rubber stop and remove upper torsion arm.



Checking Torsion Arms

1 - Check torsion arms for parallelism and twist. Insert the torsion arm in the bores of the gauge VW 282b together with the bushes provided. Insert test mandrel in torsion arm eye and tighten it with the clamping screw. The clearance between the mandrel and the test faces can be checked with a feeler gauge. The permissible departure from the parallelism is 0.5 mm (.020").

No attempt should be made to straighten bent torsion arms: they must in all cases be exchanged.



2 - Check contact faces of torsion arm eyes for wear. If worn, reface them by means of cutter VW 217.

3 - Inspect bearing points for wear. If only slightly worn, the torsion arms of both sides can be interchanged. Signs of seizure or increased wear necessitate a removal of the torsion arms.

Note:

Upper and lower torsion arms are not interchangeable (shock absorber mounting).

Important

The outer needle bearing surface on the torsion arm is surface hardened.

Installation

This is a reversal of the removal procedure, but the following points should be observed:

1 - Check needle bearings torsion arm bushes in front axle tubes for wear, renew them if necessary.

2 - If necessary, renew the dust seals.

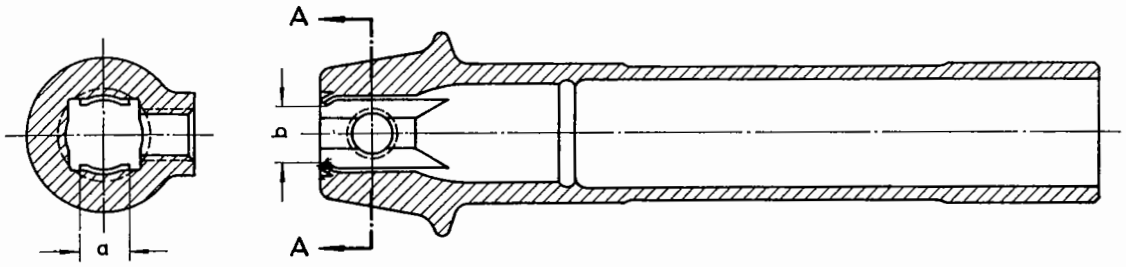
3 - Grease torsion arm with Universal Grease and insert it in the front axle tube until the tapped hole is in line with the recess in the torsion bar. Tighten set screw and secure it by means of the nut.

4 - Lift up upper torsion arm and push rubber stop in position.

Note:

The ends of the 8-leaf torsion bars are not welded. The outer edges of the square holes in the torsion arms are peened as shown in the drawing to prevent the outer split leaves from moving outward. A 14 mm chisel is suitable for peening.

5 - Re-install shock absorber, using new lockwasher, and tighten it to 3.0—3.5 mkg.



a = 14 ± 1 mm (0.551" ± 0.039") b = 17 mm max. (0.669")

Removing Shock Absorber Mounting Stud from Torsion Arm

General Note

When renewing a shock absorber mounting stud at the lower torsion arm, a 0.5 mm (.02") oversize stud must be used. The hole in the torsion arm has become larger by the pressing in of the original stud so that another stud of the same size would have a loose fit. It is, therefore, necessary to use the oversize stud D_2 12.489—12.500 mm (.4917"—.4921") instead of the standard stud 11.989—12.000 mm (.4720"—.4724").

Removal

1 - Remove torsion arms.

2 - Drive out retaining pin.

3 - Remove stud. In the case of the stud being broken off, mark the piece in the torsion arm by means of a center punch and drill a center hole, using a 3 mm (.12") drill. Bore out the remaining piece with a 10.75 mm (.23") drill. The thin shell remaining around the drill will come out during the final drilling revolutions.

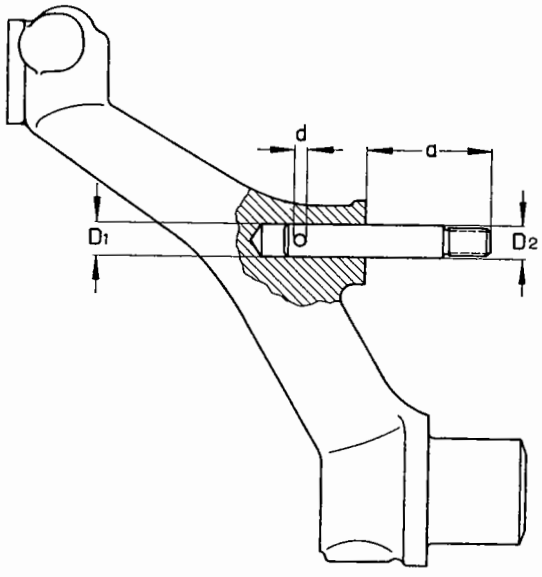
Installation

1 - Bore the hole with a 12.3 mm (.48") drill and ream it with a reamer 12.5 mm (.49") P 8 = 12.455—12.482 mm D_1 (.4903"—.4914"). If a reamer of the size 12.5 mm P 8 should not be available, make the stud to fit the hole by grinding it to the required diameter. The stud must in all cases be a press fit 0.01—0.05 mm (.0004—0020") in the torsion arm.

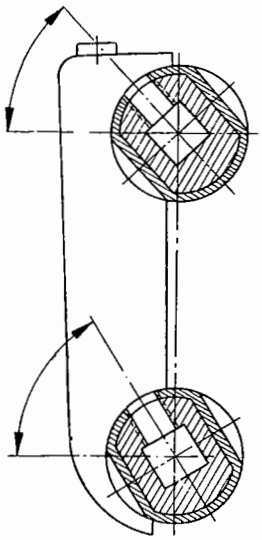
2 - Press oversize stud in place, taking care that the projecting end has a length of a = 45.0—45.5 mm (1.77"—1.79").

3 - Drill hole d = 4.00—4.08 mm dia. (.157"—.160") for retaining pin in the stud.

4 - Drive in retaining pin.



Torsion Bars

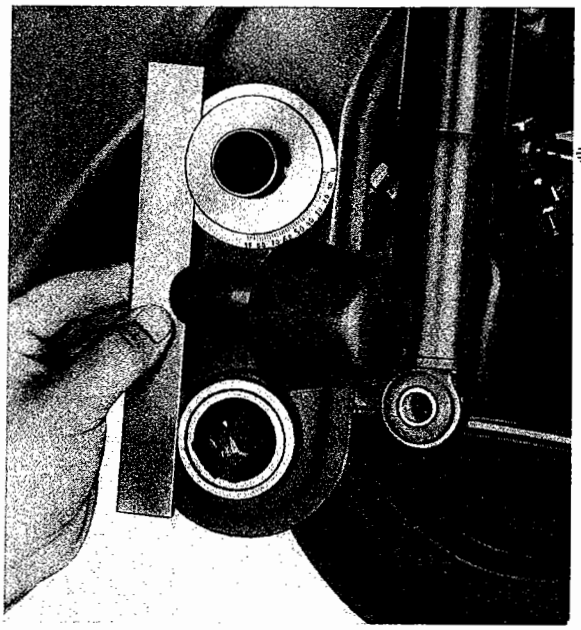


General Description

The torsion bars of the front axle consists of two groups of eight steel leaves each. The torsion bars are anchored in the center of the tubes and secured in position by means of a set-screw and a lock-nut each. The mounting angles are:

Upper torsion bar 49° ± 1°

Lower torsion bar 51° 30′ ± 1°



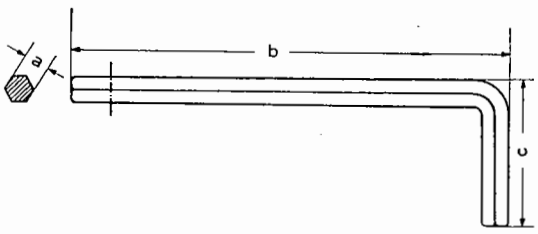
The device VW 668 is available for checking the mounting angles.

Note:

When replacing a torsion bar, the new bar must have the same number of leaves as the old one. The mounting angle of the center anchor is different for torsion bars with different numbers of leaves. Thus eight-leaf torsion bars with the above setting must only be replaced by eight-leaf bars, otherwise the smooth riding qualities will be adversely affected, causing the suspension to "bottom".

Removing and Installing Torsion Bars

(Front axle in situ)



a = 8 mm (.31″)
b = 135 mm (5.31″)
c = 45 mm (1.77″)

Removal

1 - Remove stabilizer and shock absorbers on both sides.

2 - Remove torsion arms on one side.

3 - Release lock nut and setscrew at center anchor.

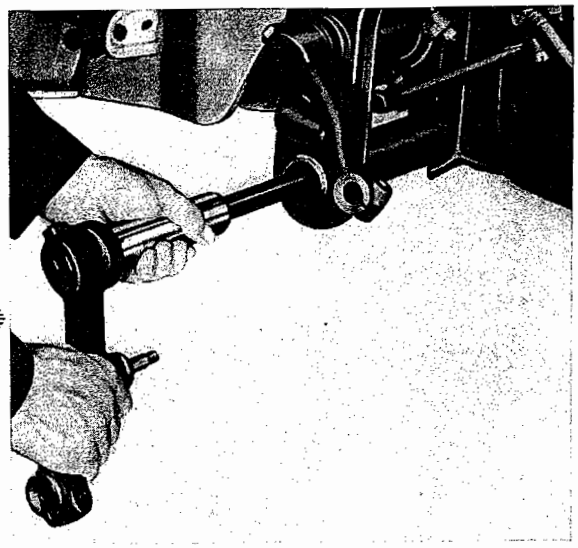
Note:

The setscrew for the upper torsion bar can no longer be removed by means of VW 156 (8 mm socket wrench) and VW 150 (angular handle) with the front axle installed.

The key for the earlier type oil drain plug (8 mm hex.) can be used for this purpose. If not available, this key can be made locally of 8 mm (.31") hex. section steel.

4 - Take off rubber stop on torsion arm.

5 - Pull out torsion arm of the opposite side together with the torsion bar.



Note:

It is not necessary to mark the direction of torsion imposed on the bars, as this has no bearing on the service life of the bars.

Installation

This is accomplished by reversing the removal procedure, but the following points should be observed:

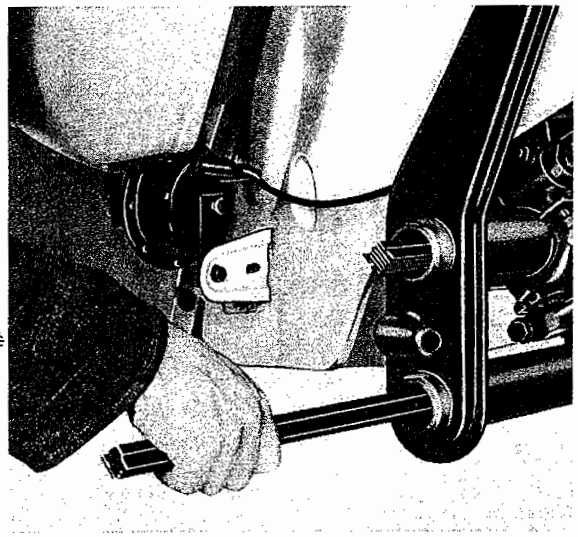
1 - Clean torsion bars, check for cracks, replace if necessary.

2 - Check torsion arms, needle bearings and torsion arm bushes, replace if necessary.

3 - When installing torsion bars, note the number of steel leaves.

4 - Coat torsion bar with Universal Grease prior to its installation.

5 - Bring the recess in the center of the bar in line with the hole for the setscrew; tighten center setscrew and secure with lock nut.



Removing and Installing Torsion Arm Bushes and Bearings

Removal

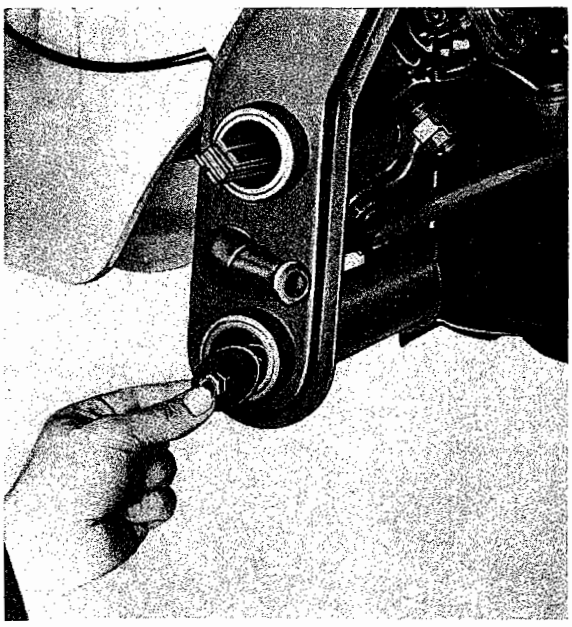
1 - Remove torsion bars.

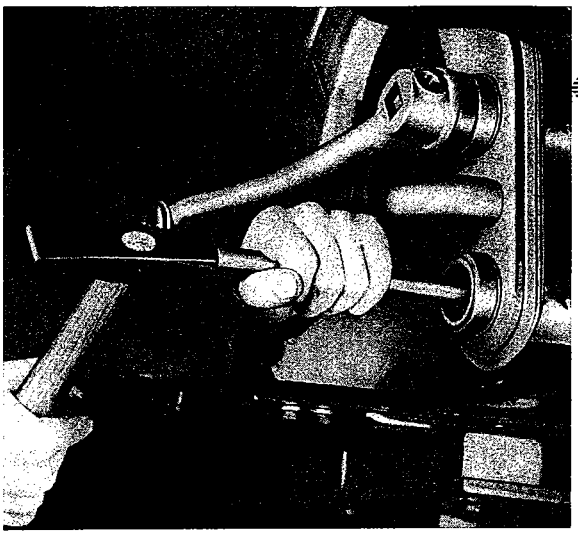
2 - Remove grease nipples in front axle tube.

3 - Remove the needle bearing and inner bush with torsion arm bush drift VW 638 (local manufacture).

4 - Attach extractor disk for passenger cars to the rod. Insert the rod in the axle tube, guiding it by means of the center anchor.

5 - Insert the extractor disk and move the rod towards the disk until it meets the shoulder of the needle bearing.





6 - Drive out the needle bearing by hammering the end of the rod.

7 - Insert the disk again and drive out the inner bush in the same manner.

Installation

1 - Clean front axle tubes, especially the seating surfaces of needle bearing and bushes.

2 - Check the condition and measurements of the needle bearing seating surface. The needle bearings are a press fit in the axle tubes. The diameter of the bearing seat:

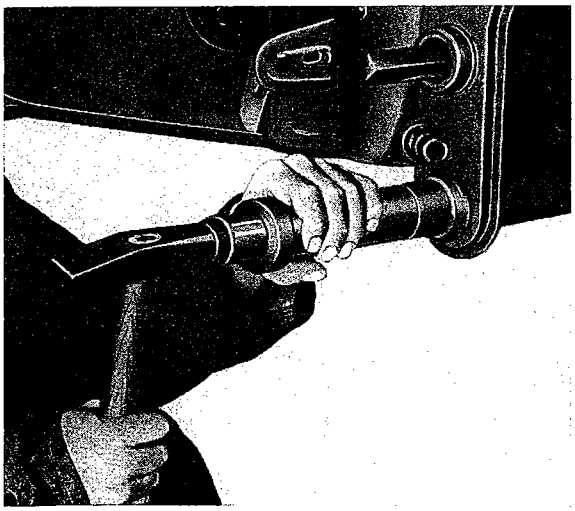
46^{N7} = 45.992/45.967 mm (1.8107"—1.8097")

Normally needle bearings with a diameter of 46 mm are installed. In isolated cases the diameter is sometimes larger and then is:

46.2^{N7} = 46.192/46.167 mm
(1.81858"—1.81759")

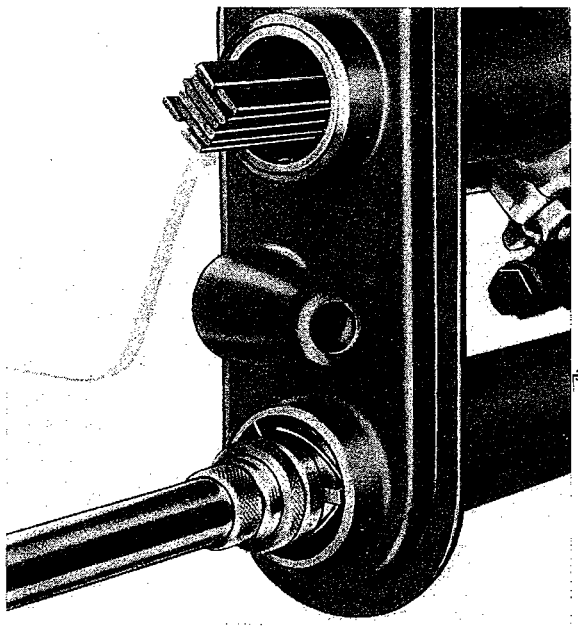
The corresponding needle bearing has an outer diameter of 46.2 mm (1.820").

In certain cases it is possible to eliminate slight signs of wear on the needle bearing seating surface, but in all cases a correct press fit must be ensured. If the diameter of the bearing seat in the axle tube is no longer correct, new front axle tubes must be installed as it is not possible to rework the seating surface.



3 - Clean the needle bearing thoroughly by removing all traces of the old grease. Check the condition of the bearing. If it shows signs of wear or damage it must be replaced.

4 - Before installing the needle bearing check the diameter of the bearing seat. Only install bearings with a corresponding outer diameter.



5 - Place inner bush on the longer guide portion of the drift VW 273a so that the open side of the lubrication groove faces the grease nipple. Drive in the bush until the collar of the drift buts against the tube.

6 - Ream up inner bush with reamer VW 274a. The reamer is centered by the guide rod which enters the anchor in the center of the tube. The reamer is supported in the bearing seating surface by the guide bush EL 20.

The fitting clearance between torsion arm and bushes is:

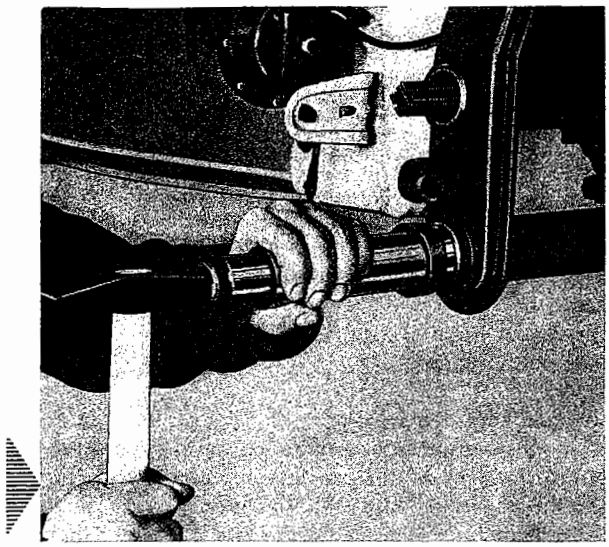
0.20—0.27 mm (.008"—.011")

Ream the bushes to the following dimensions:

Torsion Arm	1 - Bushes 2 - Reaming dimension
From Chassis No. 2921552 36.95—37.00 mm dia. (1.4539″—1.4547″)	1 - 37.15—37.20 mm dia. (1.4626″—1.4646″) 2 - 37.20—37.25 mm dia.

7 - Blow out the axle tube with compressed air and carefully clean the bearing seats.

8 - Grease the seating surface, needle bearing outer race. Push the bearing on to the short guiding portion of the drift and drive it into the axle tube.



9 - Reinstall grease fitting. Renew damaged grease fittings.

10 - Lubricate the front axle assembly with Universal Grease.

Checking Front Axle Tubes

General

Front axle tubes which are suspected to be out of alignment after an accident should be checked with the gage VW 256a.

Important

Bent front axle beams must not be straightened. Apart from the fact that heat treatment or cold straightening would reduce the strength and consequently the safety factor, workshops have not got the means of checking the alignment of the tubes, the angle of the centre anchors and the quality of the welding seams.

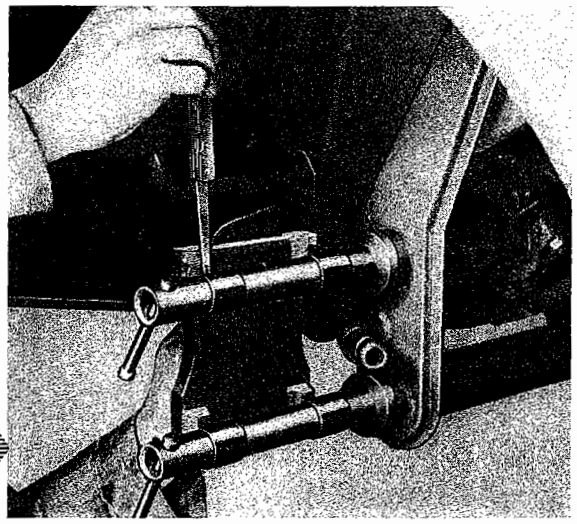
Inspection

1 - Check torsion arm bushes and needle bearings for wear. If necessary, install new bushes and bearings and ream them up as otherwise the tube alignment cannot be correctly measured.

2 - Insert the two mandrels of the gage VW 256a in the front axle tubes as far as they will go.

3 - Contact test plate with the four cylindrical test surfaces of the mandrels and check for twist by means of a feeler gage.

Permissible deviation from the parallel: 0.2 mm (.008″).



Shock Absorbers

General

The front axle of the Volkswagen is equipped with double-acting, hydraulic shock absorbers of the telescope type which absorb road shock and prevent excessive rebound. The resistance of the shock absorber is progressive, that is, the damping effect increases when large or sudden movements of the wheel take place.

As both the compression and rebound actions of the shock absorbers correspond to the springing characteristics of the car, no attempt should be made to change the adjustment or to fit shock absorbers of other characteristics. The riding qualities would otherwise be seriously affected.

Inspection and Maintenance

Shock absorber action may be roughly checked by bouncing each corner of the car in turn or by riding the car over uneven roads. A more accurate check can be made by means of testing appliances which are generally not available at the workshop.

A simple check of the removed shock absorber can be carried out by holding it vertically and compressing it by hand. But this method will only give an indication whether or not there is a resistance; the degree of efficiency of the compression and rebound strokes cannot be determined.

The equipment for the VW test station contains a testing machine on which the operation of the shock absorbers installed on the car can be properly tested. Further information can be obtained from the Technical Service Department on request. Shock absorbers which do not function correctly or which lose fluid at a high rate must be replaced — preferably by one of the same make.

If only a slight loss of fluid has taken place and the function of the shock absorbers is still satisfactory, there is no need for an exchange, as an adequate fluid reservoir compensates smaller losses. In this respect the shock absorber requires no maintenance attention. Service is, therefore, confined to a check for normal function and a periodical examination of the anchorage at front axle and torsion arm.

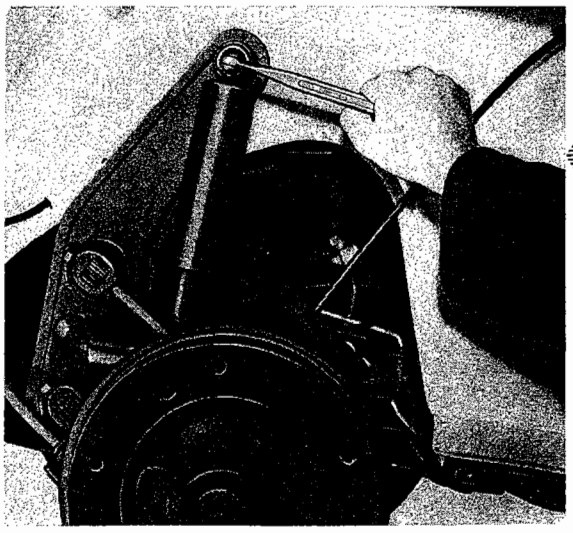
Replacing Shock Absorbers

When exchanging shock absorbers it is permissible to use shock absorbers from different manufacturers on one front axle.

Shock absorbers for the front axle are painted black, and for the rear axle red-brown.

> **Important**
>
> When changing front shock absorbers, make sure that only shock absorbers meant for the front axle are used. It is inadmissible to use any other shock absorbers on account of the totally different characteristics.

Removing and Installing Shock Absorber



Removal

1 - Raise car and remove front wheel.

2 - Remove torsion arm stud nut and fixing bolt at front axle beam.

3 - Remove shock absorber.

Installation

This is accomplished by reversing the removal procedure, but the following points should be observed:

1 - Check shock absorber; if necessary exchange shock absorber for a new one of the same type.

2 - Examine shock absorber rubber bushes for wear. Renew worn bushes.

3 - Inspect fixing stud and bolt for wear and replace them if necessary.

4 - Use new lock washers if necessary.

5 - Tighten nut and bolt to 3.0—3.5 mkg (22 to 25 ft. lbs.) so that they bear securely against the rubber bearing bushes, otherwise premature wear and rattling during operation will be the result.

Note:

1 - From Chassis No. 3 250 900 all axles are equipped with softer shock absorbers which improve the springing characteristics and riding qualities.

Part Numbers		front	rear
New:	111 413 031 J 111 413 031 K	intermittently	111 513 031 F 111 513 031 G
Previously:	111 413 031 F 111 413 031 G	intermittently	111 513 031 C 111 513 031 D

The shock absorber which was installed prior to the series introduction of both shock absorbers is marked with a white paint spot on one of the securing eyes. The new shock absorbers can be service installed on all Volkswagen from Chassis No. 2 528 668 (August 1959), but only on all four wheels at the same time. The previous type shock absorbers will remain available as spare parts.

2 - Shock absorbers from Messrs. Hoesch are being installed on the front axle from September 1963, Chassis No. 5 765 471 and the rear axle from October 1963, Chassis No. 5 813 842 in addition to those from Boge or Fichtel and Sachs. The Hoesch shock absorbers differ externally from the other two types in that the protective tube is made of a PVC synthetic material. Contrary to the instructions for the Boge or Fichtel and Sachs types, these shock absorbers are installed with the protective tube at the **bottom.** The Hoesch shock absorbers are not supplied as spare parts.

The following shock absorbers supplied as spare parts can be installed together with the Hoesch type:

	Make	Part No.	Remarks
front axle	Boge Fichtel & Sachs	113 413 031 A 113 413 031 B	
	Boge Fichtel & Sachs	111 413 031 J 111 413 031 K	These shock absorbers will be discontinued when stocks are exhausted.
rear axle	Boge Fichtel & Sachs	111 513 031 P 111 513 031 Q	

The following shock absorbers **must not** be installed together with the Hoesch type:

	Make	Part No.	Remarks
rear axle	Boge Fichtel & Sachs	111 513 031 F 111 513 031 G	These shock absorbers will remain available as spare parts.

Important

On vehicles up to Chassis No. 5 813 841, only Boge shock absorbers — Part No. 111 513 031 F — and Fichtel and Sachs shock absorbers — Part No. 111 513 031 G — are to be used on the rear axle.

3 - Special heavy duty shock absorbers which are not greatly affected by tropical heat, high continuous stress or flying stones are now available. These shock absorbers can be ordered as optional extras under the number "M 103".

The shock absorbers are identified by the following numbers:

Front	Color	Rear	Color
111 413 031 N/M	black	111 513 031 J/K	red-brown

These numbers, with the first letter N and J are the Part Nos.

The shock absorbers differ from the standard version in the following parts:

Outside diameter of outer tube:
54 mm (standard: 46 mm)

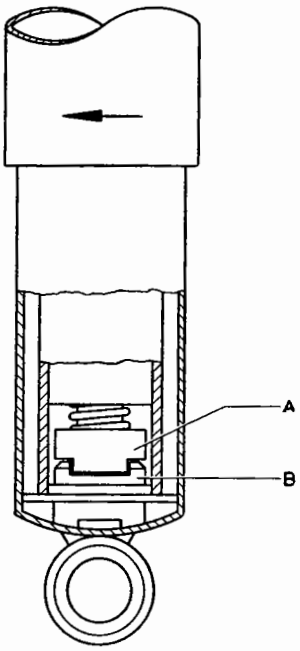
Larger diameter piston:
32 mm (standard: 27 mm)

Thickness of outer tube:
2.25 mm (standard: 1.0 mm)

Increased oil capacity.

Always replace all four shock absorbers when carrying out the installation subsequently. On the front axle the following additional parts are required:

Top:	2 spacer rings	111 413 391
	2 screws	111 413 401 B
Bottom:	2 spacer rings	111 413 391
	2 M 10 nuts (8 G)	N 11 010 4



A - Adjusting dog
B - Bottom valve

4 - **Reinforced shock absorbers**

In addition to the standard shock absorbers from Messrs. Boge and Fichtel & Sachs, a reinforced type is available from Messrs. Koni. The Koni shock absorbers Part No. 211 413 031 B (front) and 111 513 031 E (rear) are particularly suitable for use in areas where road conditions are very bad.

Adjustment

1 - Fully compress the shock absorber and turn to the left until the adjusting dog engages in the slot in the bottom valve.

2 - Turn the shock absorber from the zero position (left stop) the prescribed amount to the right in the direction "heavy".

Front shock absorber: 1/2—1 turn
Rear shock absorber: 1—1 1/2 turns

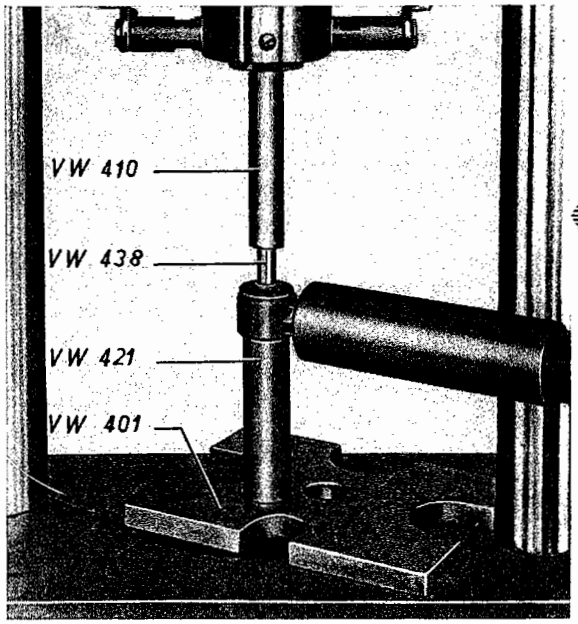
Note:

Other settings are not recommended on account of the accompanying disadvantages.

5 - From Chassis No. 4847723 — Front Axle No. 4818287 (1st August 1962 the shock absorbers are secured at the top mounting by a hexagon bolt M 12 × 1.5 (previously M 10 × 1.5), Part. No. 111 413 403 A. As a result the thread in the anchor plate has also been altered.

The hexagon bolts M 12 × 1.5 can also be service installed. To do this the bush in the anchor plate must be re-bored with a 10.2 mm dia. (.40") drill and a M 12 × 1.5 thread cut in the bush.

Removing and Installing Shock Absorber Rubber Bushes

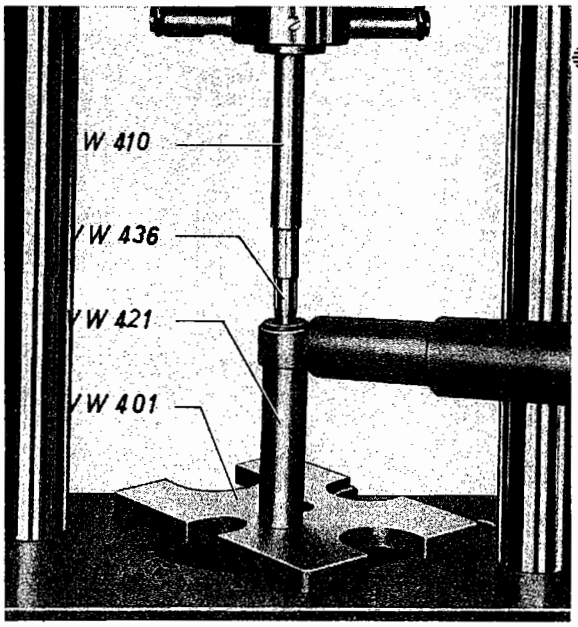


Removal

1 - Remove shock absorber.

2 - Press bush steere out on VW Repair Press with guide pin VW 438 in conjunction with VW 401, VW 410 and VW 421.

3 - Press bush out.



Installation

1 - Press bush in.

2 - Press bush steere in with guide pin VW 436 in conjunction with VW 401, VW 410 and VW 421.

3 - Install shock absorber.

Note:

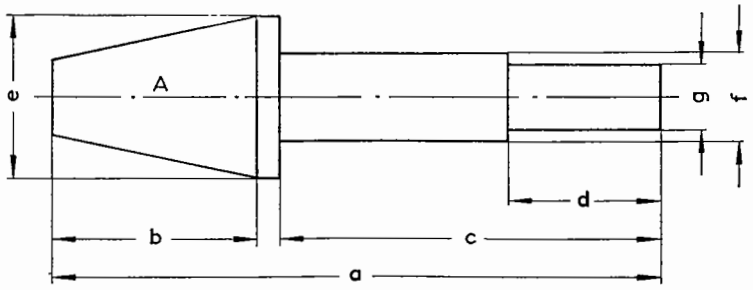
Under Part No. SP 131 the Parts Department supplies a set of rubber bushes and sleeves for reinforced adjustable shock absorbers.

Damaged or worn rubber bushes and sleeves can now be replaced. The procedure is as follows:

1 - Press out worn or damaged sleeves on the repair press VW 400 with the help of the punch VW 410, cylindrical guide pin VW 438, tube VW 421 and thrust plate VW 401.

2 - Replace worn or damaged rubber bushes.

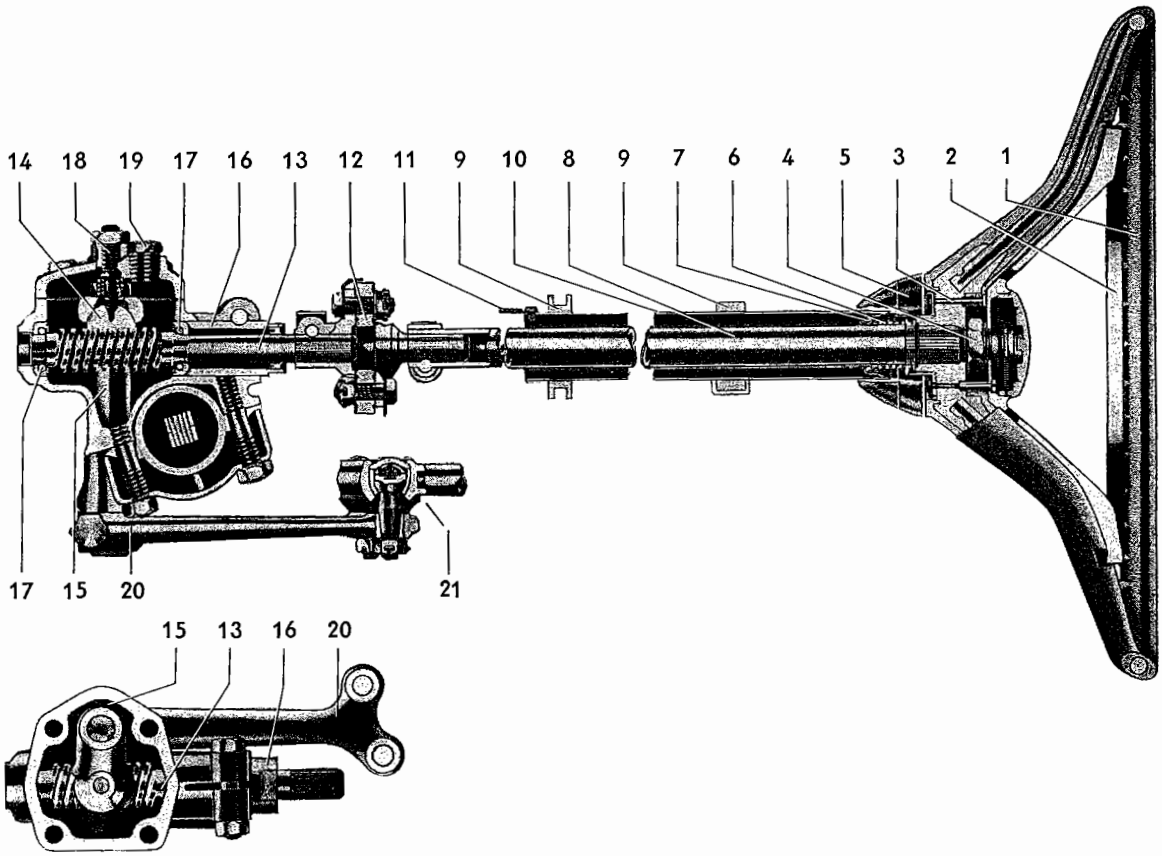
3 - Press in the new bushes with the punch VW 410, tapered guide pin, tube VW 421 and thrust plate VW 401. The tapered guide pin must be made in accordance with the sketch.



A = taper 1 : 2.1 b = 25 mm (0.98") d = 20 mm (.78") f = 11.5 mm (.45") dia.
a = 80 mm (3.14") c = 50 mm (1.96") e = 21 mm (.82") dia. g = 8.5 mm (.33") dia.

General Description

The rotation of the steering wheel is transmitted to the steering gear through the steering column and the coupling disc. The adjustable steering worm is carried in ball bearings within the steering gear case which is attached to the upper front axle tube. The hemispherical steering sector is freely located in the concave recess of the sector shaft. Tie (track) rods connected to the end of the drop arm (pitman arm) carry the steering motion to the steering arms at the front wheels.



Volkswagen Steering
(Sectional View)

1 - Steering wheel
2 - Horn ring
3 - Contact pins
4 - Steering wheel nut
5 - Flashing indicator switch
6 - Contact spring
7 - Ball bearing
8 - Steering column
9 - Rubber mounting for steering column tube
10 - Steering column tube
11 - Connection for horn cable
12 - Coupling disc
13 - Steering worm } Steering gear set
14 - Sector } Steering gear set
15 - Sector shaft } Steering gear set
16 - Adjusting sleeve (axial play)
17 - Ball bearing
18 - Adjusting screw (radial play)
19 - Oil filler plug
20 - Drop arm (Pitman arm)
21 - Tie (track) rod end

Lubrication

The steering gear should in conformity with VW lubricant specifications be lubricated exclusively with transmission oil of the specification SAE 90, under no circumstances with grease or other oils. It is accessible through a hand-opening underneath the spare wheel. The oil level should be checked regularly in accordance with the lubrication chart. The level should be kept to the lower edge of the threaded hole for the filler plug. An oil change is not required.

The tie (track) rod joints should be lubricated together with the other lubricating points of the front axle at intervals prescribed on the lubrication chart.

Maintenance

The steering gear adjustment should be checked at the intervals specified in the maintenance chart.

Free play in the steering must not be too excessive. The play in the steering system should be kept down to a minimum, but the wheel should automatically return to the straight-ahead position after turning a corner. Regular attention in accordance with the specification after the prescribed mileage considerably influences the free play, while retaining steering ease and extending the service-life of the steering.

A regular check of the toe-in insures that the front wheels remain parallel, preserves the good riding qualities of the car and reduces tire wear to a minimum. If it is suspected that the front axle has been affected by an accident, all steering linkage components should be thoroughly checked functionally whilst at the same time checking the vehicle measurements.